PUBLIC HEALTH REPORTS

In this issue

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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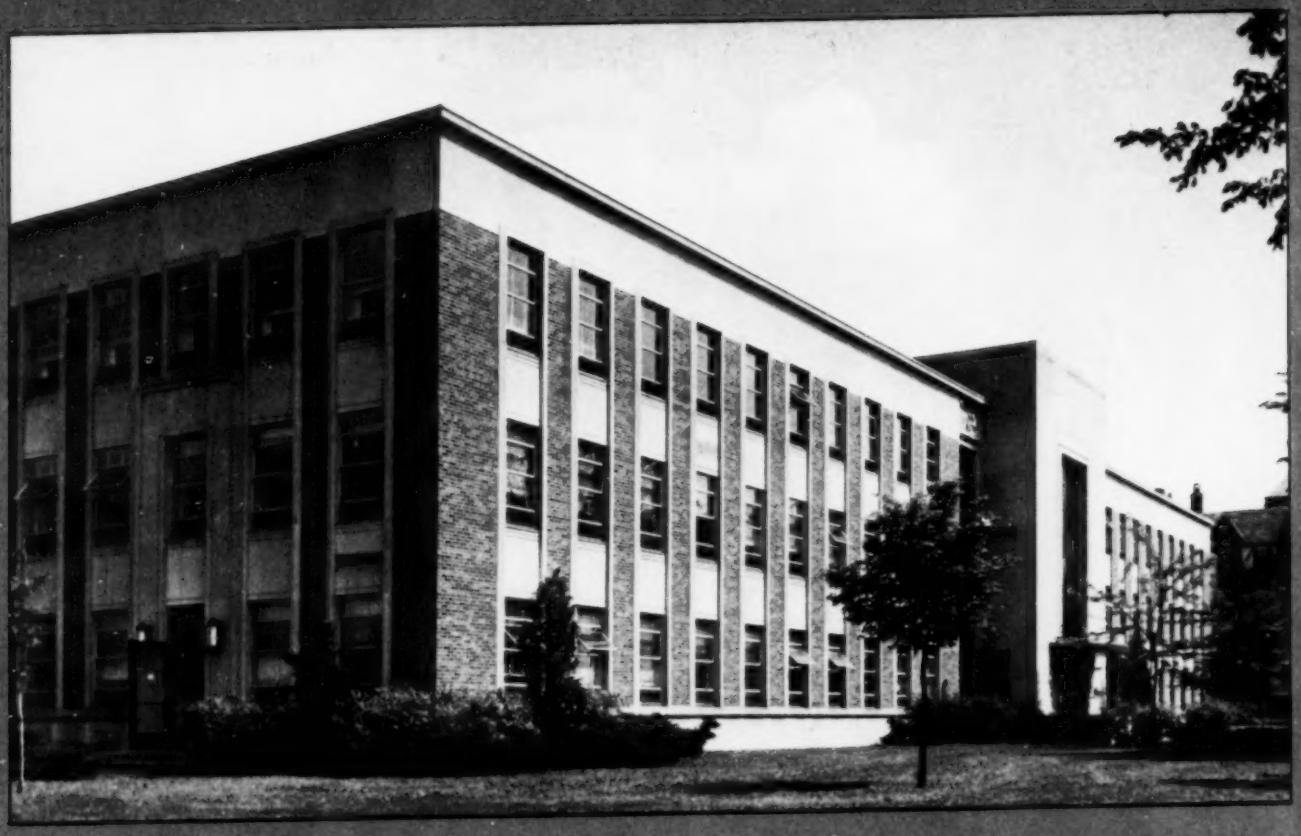

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CONTENTS

	Page
Genetic basis of acquired drug resistance. *M. Demerec.*	817
Variations in State immunization policies. *Johan W. Eliot.*	822
Health conditions among Navajo Indians. *J. Nixon Hadley.*	831
Psychology of aging—Bethesda conference. Briefs of eight papers. Two aspects of adjustment, *Robert J. Havighurst* . . . Assessment of aging, *John E. Anderson* . . . The aging nervous system, *Eugene Streicher* . . . Changes in speed and timing, *James E. Birren* . . . The intellective functions, *Harold E. Jones* . . . Education of the aging, *Wilma Donahue* . . . Skill and employment, *Nathan W. Shock* . . . Occupational roles, *Milton L. Barron.*	837
Major causes of illness and death	857
Change in tuberculosis beds occupied—Spring 1954–fall 1954. *Stanley Glaser, Josephine Johnston, and Donald A. Trauger.*	858
The 1954 National Conference on Shellfish Sanitation. *E. T. Jensen.*	869
Potential of an occupational health program in a State department of health. *Daniel Bergsma.*	872

Continued ▶

frontispiece

Public health education was carried on at the University of Michigan for more than 50 years before the establishment of a separate School of Public Health in 1941 and the opening of this building in 1943.

CONTENTS *continued*

	Page
Approaches to the quality of hospital care. *Mindel C. Sheps.*	877
WHO, the catalyst in international health. *Henry van Zile Hyde.*	887
Accidents and poisonings in children. *Julian P. Price.*	893
Limitations of water treatment methods for removing radioactive contaminants. *Conrad P. Straub.*	897
Progress in reporting mental hospital statistics—Fifth annual conference of mental hospital statisticians, Bethesda, Md., May 25–26, 1955	905
Milk sanitation honor roll for 1953–55	910
Public health pioneering—A southern heritage. Briefs from the APHA Southern Branch Conference	914
Short reports and announcements:	
Trichophyton tonsurans ringworm spreading	821
Technical publications	830
Memorandums on economic poisons	836
Medical problems of atomicw arfare	856
Institutes in care of prematures	868
Syphilis serology courses	871
Cardiovascular training center for nurses	896
PHS exhibit	904

Published concurrently with this issue:

PUBLIC HEALTH MONOGRAPH No. 30 . . . Major causes of illness and of death in six age periods.
Selwyn D. Collins, Josephine L. Lehmann, and Katharine S. Trantham.

22 pages; illustrated. A summary and information on availability appear on page 857.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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Studies of bacteria with acquired resistance to drugs throw light on the mechanism of the resistance phenomenon.

Genetic Basis of Acquired Drug Resistance

By M. DEMEREC, Ph.D.

UNTIL a very few years ago many biologists still questioned whether the hereditary mechanism that had been so effectively analyzed in *Drosophila*, maize, *Datura*, and mice, and found to apply to all the higher organisms, was also operative in lower organisms. Bacteriologists in particular were highly skeptical on this subject, probably because they considered it unlikely that such a simple mechanism, if it existed in bacteria, could have escaped detection in the course of their extensive physiological and clinical studies.

Within the past decade, however, there has been a striking change in the thinking of scientists about heredity in micro-organisms. About 10 years ago geneticists started to work with these organisms, and they developed for their research special methods utilizing a broad background of information derived from studies of higher organisms. Their results have been spectacular.

Hershey (*1*) and Delbrück and Bailey (*2*) in 1946 found that crosses could readily be made between bacterial viruses (bacteriophages), and experiments by Visconti and Delbrück (*3*) in 1953 indicated that the transmission of paternal characteristics to the offspring of such crosses is in accordance with expectation based on Mendel's law. These findings mean that the basic genetic mechanism operating in the lowest and smallest of known living beings is similar to that operating in the higher organisms, and they suggest that the fundamental laws of heredity are general and apply to all life. They do not necessarily mean that the mechanism of heredity must be identical in all details throughout the living world, nor, in particular, that chromosomes, which have been established as the carriers of the determiners of heredity (genes), in higher organisms, must be present in the same form in all organisms. Indeed, we have good reason to believe that such chromosomes do not exist in bacterial viruses. It does seem very probable, however, that the basic threadlike structure of the chromosome, the chromonema, is similar in all organisms, but that the envelope surrounding the chromonemata may be absent in the lowest organisms, such as viruses, and present in a different form in some others.

Dr. Demerec is director of the department of genetics, Carnegie Institution of Washington, and director of the biological laboratory, Long Island Biological Association, in Cold Spring Harbor, N. Y. Numerous reports of his research dealing with studies of gene structure and gene mutations have appeared in the literature. *This paper was delivered at a symposium on the nature of acquired microbial resistance to drugs, which was organized by the American Society for Pharmacology and Experimental Therapeutics, at the 39th annual meeting of the Federation of American Societies for Experimental Biology in San Francisco, April 14, 1955.*

Whereas a single chromonema is extremely slender and very probably below the level of optical visibility, the envelope makes up the bulk of a chromosome and is responsible for its characteristic appearance as observed at certain stages in dividing cells.

The discovery that bacterial viruses possess a genetic mechanism similar to that operating in higher organisms would in itself have justified the assumption that such a mechanism is present also in bacteria, for it would be remarkable, indeed, if bacteria were set apart in a class by themselves as far as heredity is concerned. In addition to this indirect evidence, however, there is a considerable body of direct evidence about the genetic mechanism in bacteria, proceeding especially from the genetical work of Lederberg and his collaborators, and from cytological studies by Robinow (*4*) and DeLamater (*5*). Thus, we are now able to say with a fairly high degree of certainty that bacteria are not essentially different from other organisms with respect to the genetic mechanism, that is, that they possess genes and chromosomes.

In the early days of genetics, and in some quarters even recently, the opinion prevailed that biologically unimportant characteristics, such as body color, shape of various organs, and the presence or absence of hairs and bristles, were determined by genes, whereas biologically important and fundamental properties, such as taxonomic differences, fertility, and the functions governing development, were determined by some other, unidentified mechanism. But with the progress of genetic research the number of such "fundamental" properties that can be supposed to depend on some extragenic mechanism has rapidly decreased, and at present there is ample evidence to indicate that genes play a major role in the transmission of almost all hereditary traits.

For example, the results of early studies by Ephrussi and his collaborators indicated that cytoplasmic constituents were responsible for the inheritance of a "petite" colony type in yeast, but later these workers were able to show by ingenious tests that genes also play a decisive role. In this yeast, treatment with euflavine suppresses synthesis of the enzyme, cytochrome oxydase, by eliminating from the cells the specific cytoplasmic components (mitochondria) that presumably produce this enzyme. The rate of multiplication of such cells is affected so that they form small colonies rather than colonies of normal size; and this pattern of growth is transmitted to the offspring. Thus, the character appears to be determined by the cytoplasmic units, mitochondria. Crosses made between these small-colony cells and normal cells from another strain of yeast, however, showed that the synthesis of respiratory enzymes requires the simultaneous presence of a cytoplasmic factor and a dominant nuclear gene. The cytoplasmic factor appears to be dependent on the nucleus in its function although independent of it in its reproduction (*6*).

Origin of Resistance

With this brief introduction, in which I have stressed the likelihood that the same kind of genetic mechanism operates in all living organisms and that it plays an important role in the hereditary transmission of almost all characteristics, I shall now take up the problem of genetic basis of acquired drug resistance. The following are well-established facts: (*a*) Bacterial strains more resistant to a certain drug than the original strain can be isolated, sometimes with great ease; (*b*) the degree of resistance may vary from slight to complete; (*c*) as a rule, the resistance is retained through a large number of transfers; and (*d*), again as a rule, the degree of resistance is not affected by the transfers. Thus, it is demonstrated that bacteria of such resistant strains have acquired a new property, which they transmit to their offspring, in other words, that we are dealing with a heritable characteristic.

With this information available, a geneticist would assume a priori that changes in genes—that is, mutations—are responsible for the origin of resistances, since it seems very improbable that some other mechanism could account for such a clear-cut and comprehensive class of properties. Substantial grounds for this assumption have been provided by experimentation carried out in several laboratories. The combined results have shown clearly: (*a*) that resistance is not induced by the presence of a

drug but appears spontaneously, as one would expect if it is caused by gene mutation (*7–14*); (*b*) that crosses made in studies of resistance to streptomycin (*15–18*), chloramphenicol (*19, 20*), azide (*21*), terramycin (*12*), and furadroxyl (Nelson, quoted in reference 22) have given rise to Mendelian segregation and linkage, as expected in genic inheritance; (*c*) that in transduction experiments streptomycin resistance is transferred in the same manner as other genic characters (*23*); and finally (*d*) that in transformation experiments both penicillin resistance and streptomycin resistance are transferred like other genic characters (*24–26*). Thus, in manner of origin and in behavior in crosses, transduction, and transformation, the characters conferring bacterial resistance to drugs conform to the type of reaction usually observed in studies of gene-determined traits.

Within the past decade another important aspect of genic reaction has been explored. It has been found that not only radiations but also a considerable number of chemical compounds are able to induce mutations in genes, and—the significant point for our consideration here—that in every known instance the effect has been nonspecific; that is, in no case studied so far has a chemical been able to induce mutations only in a certain gene or only in genes affecting one particular property. Therefore, again, it would be very surprising indeed to find that treatment of bacteria with a drug had a specific effect on the gene or genes determining their sensitivity to that drug—a postulate implied by those who claim that bacterial resistance to a drug is induced by the drug itself. Fortunately, no such assumption is necessary to account for the observed fact that resistant bacteria invariably appear after exposure of cells to certain concentrations of a drug. This result is to be expected under circumstances that are well known to students of population genetics, namely, when a strong selection pressure acts on a large, nonhomogeneous population in which many genotypes are represented. A bacterial culture or a bacterial infection is just such a population. Since bacterial cells are very small, a tremendous number of individuals can be present in a relatively small volume. For example, 1 cubic millimeter would hold about 10^9 (a billion) cells of *Escherichia coli*. From what is known about the frequency with which spontaneous mutations to drug resistance occur, it is to be expected that a population of that size would include mutants representing almost all the genes instrumental in resistance, and consequently that some bacteria resistant to any particular drug would be present. Treatment with a drug, then, would inhibit or eliminate the large body of sensitive individuals and thus would make it possible for the few resistant bacteria to multiply freely and produce a strain resistant to the drug used in treatment.

Patterns of Resistance

Studies of resistance to different drugs have shown that in the great majority of cases a high degree of resistance is attained only "stepwise," that is, through the occurrence of several consecutive mutations. From a sensitive strain we can isolate a mutant strain that is only slightly resistant (first-step resistance); another mutation occurring in such a strain will produce an increased degree of resistance (second-step resistance); and so on. With a few drugs, however, it is possible for some first-step mutants to possess a high degree of resistance. Thus, effective resistance either may be built up in several steps, or it may be attained through a single mutational event. The stepwise pattern of resistance development has been called the penicillin pattern, and the single-step pattern, the streptomycin pattern, after the drugs first used in analyzing the patterns (*8*). It is interesting to note that, as a rule, the resistance pattern is specific for the drug, in other words, that the origin of resistance to a certain drug follows the same pattern in all strains and species of bacteria.

Pattern of resistance has a very important bearing on the effectiveness with which physicians can avoid the development of highly resistant strains in clinical practice. The use of drug concentrations high enough to eliminate all first-step resistant organisms will preclude the buildup of high resistance where the stepwise pattern of origin is concerned, but no single treatment will be effective in preventing the origin of highly resistant individuals when one is dealing with the single-step pattern. Fortunately, only a small number of known drugs

elicit this single-step pattern of resistance—streptomycin, isoniazid, sodium *p*-aminosalicylate (PAS), erythromycin, and cinnamycin (*27*); all others are associated with the stepwise pattern.

Theoretically, it should be possible to avoid the development of strains resistant to the single-step pattern drugs by administering these drugs in combination with other drugs which act independently of them. In dealing with the stepwise pattern, also, the clinical use of combinations of drugs should still further reduce the chances for development of resistance. The reasoning on which this expectation is based can be outlined as follows. If the frequency of origin of mutant bacteria resistant to either drug A or drug B is 1 per 10 million (1×10^{-7}), and if mutants resistant to drug A are sensitive to drug B and vice versa, then the expected frequency of bacteria carrying both resistances is 1 per 10^{14}. Since only "double" mutants of this kind could survive appropriate treatment with a combination of drugs A and B, and thus become the progenitors of a resistant strain, the chance that resistant strains will develop is tremendously smaller when a combination of drugs is used in treatment than when a single drug is used. Laboratory experiments, the results of which are consistent with this theoretical expectation, have been reported by Szybalski and Bryson (*28*).

In clinical application of drugs, however, other factors than resistance may play a role in the survival of bacteria. Some cells may survive because they are located where they cannot be reached by a full concentration of the drug; others may be in a physiological state that confers a temporary immunity to its action. Under certain circumstances these factors may favor the selection of resistant mutants and result in the development of resistant strains in spite of treatment that theoretically should prevent such development.

In the present discussion I have emphasized the genetic mechanisms that participate in the origin of bacterial resistance to various drugs and have omitted any consideration of complicating factors, such as synergism, cytoplasmic constituents, and physiological aspects. A full discussion of these problems has been ably presented in a comprehensive review by Bryson and Szybalski (*27*).

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Trichophyton tonsurans Ringworm Spreading

A northeastern Michigan outbreak of ringworm infection caused by *Trichophyton tonsurans* was reported in the *Journal of the Michigan State Medical Society*, June 1955, pp. 687–690 and 727, by Eugene A. Hand, M.D., Saginaw, Mich., and Lucille K. Georg, Ph.D., Public Health Service mycologist.

The disease, previously almost unknown in the area, was reported endemic in both rural and urban sections of Michigan where there is a growing community of persons who have come from endemic areas in Mexico.

The Michigan outbreak is indicative of the spread of the disease on the North American continent, according to the Mycology Unit of the Public Health Service Communicable Disease Center.

Within the past 6 to 8 years, *T. tonsurans* infections of the scalp, glabrous skin, and nails have become endemic in New York and in the southwestern States, especially in Texas and southern California. Scattered cases have been reported from 13 States and Canada. Ringworm infections caused by this endothrix fungus have been common in Mexico and Puerto Rico for many years, whereas *Microsporum audouini*, the common agent of ringworm of the scalp in the United States, is rare in those countries.

Public Health Service mycologists foresee the possibility that *T. tonsurans* ringworm may constitute a health problem in the United States similar to epidemic ringworm caused by *M. audouini*. They point out, however, that the problem will be more difficult because the infections occur in both children and adults. The infections are harder to detect and usually are more refractory to treatment. Roentgen ray epilation is considered the treatment of choice.

The problem of *T. tonsurans* ringworm was previously presented in detail in *Public Health Reports*, January 1952, pp. 53–56.

State and Territorial immunization policies contain both useful variations and needless and confusing differences. Agreement on standards is advocated.

Variations in State Immunization Policies

By JOHAN W. ELIOT, M.D.

THE planning of a revision of immunization policies by the Arkansas State Board of Health in 1954 prompted a comparison of Arkansas' policies with those of the other States. Each State and Territory was therefore requested to furnish its current immunization policies to the Arkansas State Board of Health. Very helpful replies were received from all States.

Some of the States submitted their current policy statements with the understanding that revision was in process or planned. The District of Columbia and Washington preferred to wait until their revisions were completed before submitting material. Information on the two is therefore not tabulated.

Nine States, two Territories, and the District of Columbia are currently revising or planning revision of their immunization policies, and 15 States and 1 Territory have revised their policies within the past 2 years (table 1). Older policies are not necessarily out of date, as, for example, Oregon's thoughtful and thorough manual of 1950.

An increasing number of States are making use of the Report of the Committee on Immunization and Therapeutic Procedures for Acute Infectious Diseases of the American Academy of Pediatrics (*1*). Eighteen States and three Territories used this report either in whole or in part, or are making it a basis for forthcoming revisions (fig. 1).

Dr. Eliot is pediatric consultant to the Arkansas State Board of Health and assistant clinical professor of pediatrics at the University of Arkansas Medical School, Little Rock.

Compulsory Immunization Policies and Laws

The degree to which immunization policies constitute general recommendations to physicians or local health units, or specific regulations, vary and is not easy to determine in many cases. On one extreme Indiana, Maine, Ohio, Virginia, and Wyoming simply endorse the American Academy of Pediatrics report (*1*) for general use. On the other extreme Arkansas, Kentucky, Louisiana, Mississippi, Montana, North Carolina, North Dakota, Oklahoma, South Dakota, Tennessee, Texas, and West Virginia, in which a large number of immunizations are handled by public health personnel, have more definite policies. Alaska has made a major effort to set definite immunization policies because itinerant public health nurses must, at times, carry on their work far from any medical supervision. Puerto Rico has made a similar effort.

Hawaii seems to have the most specific and extensive compulsory immunization laws of any State or Territory. Hawaii legally requires

universal inoculation against diphtheria, typhoid fever, and smallpox.

Six other States and one Territory were noted to have certain immunizations which are or could be required, or which have to be made available, by law. Arkansas requires smallpox vaccination by law before school entry. In Maine, each city, town, or plantation must provide free smallpox vaccination to all, and free diphtheria and pertussis immunizations to all children under age 12 annually. In New Jersey local boards of education are empowered to require diphtheria and smallpox immunizations before school entry if they deem these necessary. New Mexico requires smallpox vaccination for school children. North Carolina law requires that diphtheria and pertussis immunizations be given to all infants before they are a year old, although there is no indication of how this is to be carried out. West Virginia law requires all children to be immunized against smallpox and diphtheria, before or at the time of school entry, by private physician, county health department, or physicians specially appointed by county courts or municipal councils. Puerto Rico makes smallpox vaccination compulsory for all citizens.

Preschool DTP Immunization

The minimum age at which combined diphtheria-tetanus-pertussis antigens (DTP) may be started is 1 month in 4 States and 6 weeks in Mississippi (table 1 and fig. 2). The minimum age is 2 months in 19 States and Alaska. Five of the latter States simply endorse the 1952 American Academy of Pediatrics report, which says, "There is no objection to beginning immunization in the second month of life." Several States recommend that a total of four DTP injections be given if they are started at age 2 months. The minimum age for starting DTP injections is 3 months in 14 States and 2 Territories, and 4 months in 2 States and 1 Territory. Rhode Island recommends starting the vaccinations at 6 months. Four States do not specify a minimum age. North Carolina and Oklahoma do not supply the combined vaccine, but recommend starting pertussis vaccine at age 2 months and diphtheria toxoid at 6 months.

The maximum permissible interval between injections in the primary DTP series varies a good deal (fig. 3). In 22 States and 1 Territory the interval is stated as 1 month, with no flexibility either way. Mississippi permits 5 weeks to elapse and 5 States allow 6 weeks. Two States and two Territories permit up to 3 months between injections, and three States permit a 4-month period. Up to 6 months is allowed between injections without asking that the series be started over in 8 States and 1 Territory, including those States which simply endorse the American Academy of Pediatrics report. A few States make no recommendation regarding this interval. Two States have continued with separate antigens. Oklahoma recommends a 1-month interval for each antigen, and North Carolina makes no recommendation as to interval.

The recommended age for giving the first DTP booster dose is fairly uniform in 35 States, Alaska, and the Virgin Islands. The age is stated as about 15 to 24 months or simply about 1 year after completion of the primary series (table 1). A few States recommend a shorter interval, varying between 4 and 10 months, before the first booster dose. Other States recommend that the first booster dose be given between ages 2 to 6. Rhode Island gives no routine DTP booster, but gives the series over if the child is Schick positive in the first grade. Most States advocate a DTP booster injection shortly before or at the time of entering school, although five preferred to omit the pertussis antigen after ages 2 to 4. Twenty-one States and four Territories feel it desirable to intersperse another booster dose between the first booster dose and the one at the start of school. Alabama feels that annual booster doses are necessary up to age 5 to maintain immunity to diphtheria.

DTP Immunization of School Children

There seems to be a fairly definite division between those States which do not continue pertussis immunization into the school years and those which do. Twenty-five States and one Territory make no recommendation of pertussis immunization in the school years. Twenty States and three Territories continue pertussis immunization in the school years. Of

the latter, 15 States and 3 Territories discontinue pertussis immunization after age 10, and 3 continue pertussis immunization in the form of DTP to ages 12 to 14. Two States recommend pertussis immunization to age 8. Colorado and Pennsylvania recommend it on exposure at any age.

Fifteen States and one Territory which do not recommend DTP vaccination in the school years advocate at least one dose of combined diphtheria-tetanus toxoids in this period. Six States permit diphtheria-tetanus toxoids as an alternate to DTP in the school period. Twenty-seven States and three Territories do not mention the use of diphtheria-tetanus toxoids in the school period. Seven States advocate separate diphtheria toxoid during the grammar school years.

Many States warn against the routine use of diphtheria toxoid for children over age 10 because of the increased possibility of bad reactions. However, 14 States have been recommending use of either usual or reduced doses of diphtheria toxoid, separately or as diphtheria-tetanus, through ages 12 to 15 (table 1). Michigan and South Dakota recommend the diphtheria toxoid at this age only for those who are Schick negative. Iowa recommends it only for those who are shown not to be sensitive to the toxoid. Those States which simply follow the American Academy of Pediatrics report presumably support its recommendation of a Schick test done at ages 12 to 14, and another 4 years later, to test immunity and to act as a small stimulating dose to arouse immunity. Vermont advocates repeated Schick tests at monthly intervals until the test becomes negative, if there is a special desire for immunizing a child over age 10 against diphtheria (usually 4 to 6 Schick tests). Rhode Island gives Schick tests to all school children in the first and fifth grades and gives Schick-positive children in the first grade a DTP immunization series or a diphtheria series in fifth grade.

Adult Diphtheria Immunization

It is evident that a number of States feel that diphtheria immunization can and should be extended to high school students. Twenty-seven States and three Territories also extend immunization to adults under various special circumstances with preliminary Schick and, sometimes, toxoid sensitivity tests (table 2 and fig. 4).

So long as there were substantial numbers of diphtheria cases and carriers among children, most adults received occasional casual exposure to the disease which served to boost their immunity to it. This concept was expressed in the immunization literature of the Territory of Hawaii. However, numerous studies (*2–4*) have shown that with the decrease of diphtheria in children, adult populations are increasingly susceptible to the disease, and when the disease has assumed epidemic proportions, a marked shift of incidence into the adult population has been shown.

Seven States have expressed concern over this trend. Massachusetts has engaged in studies, paralleling and coordinated with those of the U. S. Armed Forces, to determine a dosage and type of diphtheria toxoid which can be given safely and effectively to adults without the administrative difficulties associated with the use of Schick and toxoid sensitivity tests.

As a result of these studies, the Massachusetts Department of Public Health, division of biologic laboratories, is now producing a combined fluid diphtheria-tetanus toxoid which contains about one-tenth the amount of diphtheria toxoid contained in the standard diphtheria-tetanus mixtures. This product is being used both for primary immunization and for booster immunization against diphtheria and tetanus in adults. It is similar to, but has even less diphtheria toxoid than, the diphtheria-tetanus toxoids used successfully by the Canadian armed forces for the past several years. The U. S. Armed Forces have developed a precipitated product with similar properties (*5*). None of these products requires prior Schick or toxoid sensitivity testing. Arkansas plans to utilize the type of material developed by the U. S. Armed Forces for diphtheria immunization in adults.

Tetanus Immunization Intervals

The importance placed on continued tetanus immunization in older children and adults varies a good deal. Nineteen States and two

Table 1. Summary of DTP immunization policies, United States and Territories

State or Territory	Date of last policy revision	Preschool children			School children		Diphtheria for adults when needed
		Minimum age (in months)	Maximum dose intervals (months)	Age for boosters (years)	Pertussis not included after age	DT recommended in school at age	
Alabama	May 1951	3	1½	1½, 2½, 3½, 4½	6		[1]
Arizona	1954–55 [2]	2		To 2d grade	6	10	
Arkansas	June 1955 [3]	1	6	1½, 5½	6–10	10, 15	[4]
California	1950–1952	3	1	1½, 5	6	10, 15	[1]
Colorado	July 1949	3	1	1½, 5½	8		[1]
Connecticut	Oct. 1954	3	6	1½, 3½, 6, 9	10	10	
Delaware	1952 [3]	4	1	1½, 6, 9	10		
District of Columbia	In revision [5]						
Florida	April 1952	2	1	1–1½, 4–5, 8	6		
Georgia	In revision	3	1	1½, 4–5, 7–8	6		
Idaho	1952 [3]	3	1	1½–2, 6	6	10, 15	
Illinois	Oct. 1954	2	1	1½, 4, 7, 10	10	10, 14	[6]
Indiana	(1952) [3]	2	6	1½, 3, 6	10		[6]
Iowa	Oct. 1952 [3]	2	4	1½, 5	6	10	[7]
Kansas	No date	3	1	1–2, 5–6	6	[8] 7–10	
Kentucky	In revision [3]	2	4	1–1½, 3, 6	6	9, 12	[1]
Louisiana	Nov. 1954 [3]	2	3	1, 2, 6	10		[6]
Maine	(1952) [3]	2	6	1½, 3, 6	10		[6]
Maryland	In revision [3]	4	4	1, 3, 5	10		[6]
Massachusetts	1952, 1954 [9]	2	1½	1½	About 4	6, 11, 15	[4]
Michigan	1952	3	1½	2–3	3	5, 10	
Minnesota	Feb. 1952	3	1	1½–2, 5–6	6	9, 12, 15	[6]
Mississippi	Aug. 1954	1½	1¼	1¼–2¼	4	6, 10	
Missouri	No date	2	1	1¼, 3–4, 6	6	9–10	
Montana	April 1954	1	1	1¼, 4, 7, 10	10		
Nebraska	1948	3	1	1½, 6	6	12	
Nevada	No date [10]		1	About 2, 6	6		
New Hampshire	1952 [3]		1½				[7]
New Jersey	1954			2, 5, 8, 11, 14	12–14		
New Mexico	Aug. 1954 [3]	1	6	1, 4, 6, 8	10		
New York	In revision [3]	3	1	1½, 5	6	10, 15	
North Carolina	do [3]	[8] 6		1, 6 [8]			
North Dakota	do	3		2, 5, 8, 11, 14	12–14	8, 11, 14	[4]
Ohio	(1952) [3]	2	6	1½, 3, 6	10		[6]
Oklahoma	April 1951	[8] 6	[8] 1	3, 6 [8]	6	[8] 12	[4]
Oregon	Dec. 1950	3	3	1½, 5	6	10, 15	[6]
Pennsylvania	In revision	2	1	1, 3–4	4	[8] 7, 11	[1]
Rhode Island	No date	6	1	6 [11]	8	[8] 6, 10	
South Carolina	do	2	1	1½, 3	10	[8] 6, 10	
South Dakota	do		1½	5–6	6	6	[1]
Tennessee	1953 [3]	2	1	1½	About 4	[8] 6	[7]
Texas	1953	2	1	1, 3, 6	6		[7]
Utah	In revision	1	1	1¼, 3, 6	6	9, 12	[6]
Vermont	Feb. 1954	2	1	1, 3, 6	6	8, 10	[12]
Virginia	(1952) [3]	2	6	1½, 3, 6	10		[6]
Washington	In revision [5]						
West Virginia	March 1955 [3]	3	1	1, 3½, 6	9–10		[6]
Wisconsin	May 1952	2	1	2–3, 5, 8, 11, 14	12–14		
Wyoming	(1952) [3]	2	6	1½, 3, 6	10		[6]
Alaska	In revision [3]	2	3	1½, 3, 6, 10	10		[6]
Hawaii	Nov. 1954 [3]	3	6	3, 5, 7	10		
Puerto Rico	Jan. 1950	4	1	¾, 2, 5	6	6, 10	[1]
Virgin Islands	In revision [3]	3	3	1½, 3, 7, 10	10		[1]

[1] After Schick test. [2] From State plan. No printed policies. [3] Use or planning to use the American Academy of Pediatrics report, 1952. (Date in parentheses indicates the States that adopted the report in lieu of separate policies.) [4] No Schick or toxoid sensitivity test. [5] Present policies not available. [6] After Schick and toxoid sensitivity tests. [7] After toxoid sensitivity test. [8] Diphtheria only, not DTP or diphtheria-tetanus. [9] Reference 6. [10] No written policies, but description of work is quite up to date. [11] Primary series repeated at 6 years if Schick positive. [12] Repeated Schick tests used.

Territories make no mention of routine tetanus toxoid booster doses beyond school age (table 2). Two States recommend that persons get a tetanus booster dose every 2 to 3 years. Eleven States and one Territory recommend this dose every 3 years. One State recommends an interval of 3 to 4, and 6 States recommend 3 to 5 years. Two States recommend a booster dose every 4 years, and 3 States recommend boosters every 5 years. Hawaii recommends a tetanus toxoid booster every 8 years, and Massachusetts recommends a 5-year interval through school years, and an interval of 10 years after school. Arkansas will follow the same schedule as Massachusetts.

Smallpox Vaccination Policies

The emphasis placed upon repeated smallpox vaccinations likewise varies from State to State, although nearly all States mention revaccination in the presence of a smallpox epidemic. Eighteen States and two Territories recommend revaccination at 5-year intervals throughout life, while others recommend it every 5 to 6 years, 5 to 7, 5 to 9, or 5 to 10 years (table 2). A few States recommend intervals of 3 years, 3 to 4, or 3 to 5, or 4 to 5 years. Connecticut recommends revaccination "periodically." Nine States and two Territories make no mention in their immunization policies of smallpox vaccinations continued on through school and adulthood, while Oklahoma continues smallpox vaccinations only through school. Ipsen, of the Massachusetts Department of Public Health, recently advocated an interval of 10 years between smallpox vaccinations in adults as providing a level of immunity in the population sufficient to prevent rapid epidemic spread of the disease (*6*). Arkansas will follow this policy.

Only a few States indicate how soon a smallpox vaccination should be repeated if it fails to take. Pennsylvania permits it to be repeated in 5 days, Missouri permits it in 7 to 9 days, and Arkansas, Michigan, and Oklahoma permit it in 2 weeks. Idaho, Iowa, and Mississippi require a 3-week wait, and New Mexico and West Virginia require 4 weeks between vaccination attempts.

Typhoid Immunization Policies

The giving of immunizations against typhoid fever is subject to wide variation. On one extreme are 10 States and the Virgin Islands which do not carry out this immunization or do not mention it in their policies. On the other extreme, Hawaii requires universal typhoid immunization by law. Most States take a middle ground, recommending typhoid immunization only for individuals exposed to a case of the disease or to a carrier, for individuals forced to use an unsafe water supply (as in disaster areas), for individuals dwelling in or travelling into areas where the disease is endemic, and sometimes for individuals about to go to a summer camp or about to travel generally. Most southern and southwestern States and Puerto Rico place greater emphasis on the immunization, or have done so in the past. These States generally recognize the need for this immunization on a routine basis in portions of their rural areas at the present time.

The interval permitted between typhoid vaccine injections in the primary series is about 1 week in 11 States and 1 Territory, 1 to 2 weeks in 3 States, 1 to 3 weeks in 1 State, and 1 to 4 weeks in 13 States and 2 Territories, and 1 month in 1 State.

A minimum age for starting typhoid immunizations is usually not stated, but in 14 States typhoid vaccine is given at any age when indicated. In 5 States and 1 Territory it is given at age 1 or under when needed, and in 2 States only over age 1.

Of the 37 States and 3 Territories which mention typhoid immunizations, 22, including Arkansas, authorize and encourage the use of intradermal typhoid booster doses, either in their own publications or through endorsement of the American Academy of Pediatrics report. The other States simply do not mention intradermal typhoid booster doses; no State specifically forbids them.

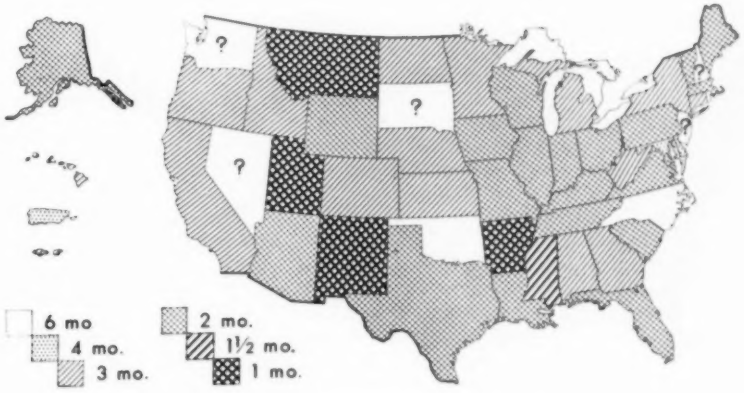
The interval between typhoid booster doses is set at 1 year in 10 States, at 1 to 2 years in 13 States and 1 Territory, at 1 to 3 years in 1 State, at 2 to 3 years in 1 State, and at 3 years in 3 States, including Arkansas. It is not mentioned in the Puerto Rico manual.

Figure 1.

Use by States of the American Academy of Pediatrics report.

Figure 2.

Minimum ages recommended for starting primary DTP vaccination series.



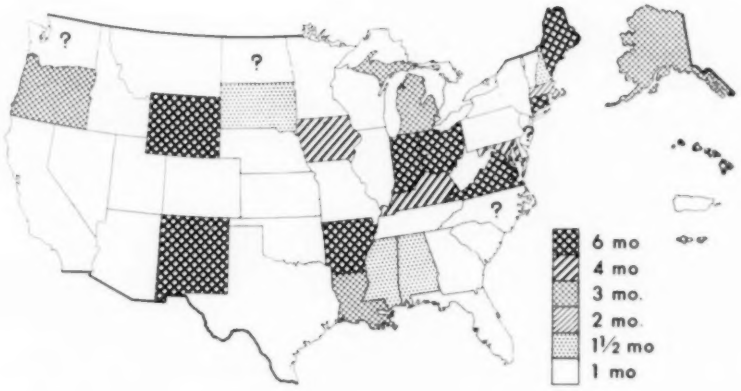


Figure 3.

Maximum intervals allowed between doses in primary DTP vaccination series.

Figure 4.

Diphtheria, tetanus, and smallpox immunizations available or advocated for adults.

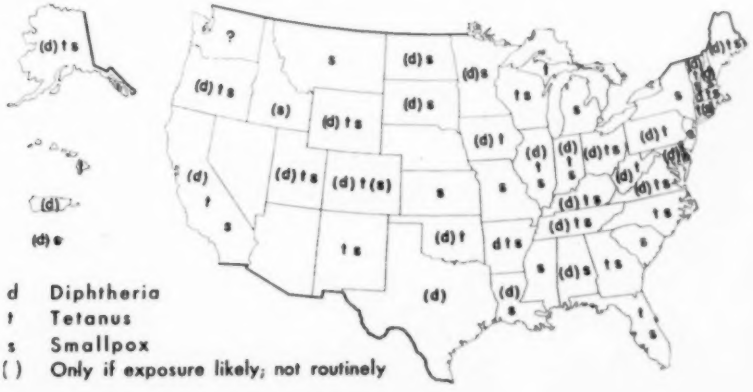


Table 2. Summary of smallpox, tetanus, and typhoid immunization policies in the United States and Territories

State or Territory	Smallpox vaccination first given at age (months)	Smallpox vaccination intervals in adults (years)	Tetanus booster intervals in adults (years)	Typhoid immunization [1]		
				Begin at age (years)	Initial dose intervals (days)	Booster intervals (years)
Alabama	3	5–7	Not used	2	5–10	1.
Arizona	Any age	Not used	do	No mention	Not stated	Not stated.
Arkansas	With 1st DTP	10	10	With 1st DTP	7–28	3.
California	5	5	3–5	No mention	7–28	3.
Colorado	In 1st 12	In epidemic	2–3	1	7	2.
Connecticut	3–6	do	3	No mention	Not stated	Not stated.
Delaware	12	5–9	3			
District of Columbia [2]						
Florida	After DTP	3–4	3–4	No mention	7–21	3.
Georgia	5–6	5	5	do	Not stated	Not stated.
Idaho	By 6	In epidemic	Not used	No mention	do	do
Illinois	3–6	3	3–5	Any age	7–10	1–2.
Indiana	6–12	5	3	do	7–28	1–2.
Iowa	[3]	Not used	3–5	do	7–28	1.
Kansas	No mention	3–5	Not used			
Kentucky	3–6	5–7	2–3	½	5–14	2–3.
Louisiana	4	5	Not used	No mention	7–14	1.
Maine	6–12	5	3	Any age	7–28	1–2.
Maryland	6	Not used	Not used	do	7–28	1–2.
Massachusetts	3–9	10 [4]	10 [4]			
Michigan	Under 5	5	5	Any age	7–28	1.
Minnesota	3–12	5–6	Not used	No mention	7	1.
Mississippi	1½	5	do	½	5–14	1–2.
Missouri	3–4	5	do	Any age	7–10	1–2.
Montana	⅓	3–5	do			
Nebraska	3	Not used	do	No mention	7	1–2.
Nevada	With 1st DTP	do	do	do	Not stated	Not stated.
New Hampshire	Birth–36	5–7	do	Any age	7–10	1–2.
New Jersey	In 1st 12	5	do			
New Mexico	1½	5–10	3	1	7–28	1–2.
New York	3	5	Not used			
North Carolina	Under 3	5	3–5	1	7	1.
North Dakota	3	5–7	Not used			
Ohio	6–12	5	3	Any age	7–28	1–2.
Oklahoma	9	Not used	4	3	7	1.
Oregon	In 1st 12	5	3–5	Any age	7–28	1.
Pennsylvania	do	Not used	4			
Rhode Island	[5]	do	Not used			
South Carolina	5	5–7	do	1½	30	2.
South Dakota	No mention	5	do	No mention	7	1.
Tennessee	In 1st 12	5	3	Any age	7 or longer	1–2.
Texas	5–6	Not stated	Not stated	do	7–28	2.
Utah	3–6	4–5	3–5	1	7–10	1.
Vermont	2	5	3	No mention	Not stated	Not stated.
Virginia	6–12	5	3	Any age	7–28	1–2.
Washington [2]						
West Virginia	6	Not used	3	2	7 or longer	1–3.
Wisconsin	In 1st 12	3–5	5			
Wyoming	6–12	5	3	Any age	7–28	1–2.
Alaska	[6]	5	3	do	7–28	1–2.
Hawaii	5	Not used	8	½	7–28	2.
Puerto Rico	3–12	do	Not used	No mention	7	Not stated.
Virgin Islands	6	5	do			

[1] Typhoid immunizations not mentioned in policies of Delaware, Kansas, Massachusetts, Montana, New Jersey, New York, North Dakota, Pennsylvania, Rhode Island, Wisconsin, and the Virgin Islands. [2] Present policies not available. [3] Before or after DTP. [4] As recommended in reference 6. [5] Only mentioned as a procedure to be done by private physician. [6] With DTP or 1 month later.

Public Education

Some States furnished samples of immunization information available to parents, and presumably most States have such material. Some of these pamphlets are very thoughtful and attractive, for example, those from Connecticut, Delaware, Idaho, Massachusetts, Minnesota, Nebraska, Wisconsin, and Hawaii.

Special emphasis is put on public information and education concerning immunizations in various ways by different States. Arkansas stresses information for the public and for school authorities in its new question and answer manual concerning immunizations. Delaware sends a letter concerning immunizations to every family as the new infant nears 4 months of age. The Iowa immunization manual places thoughtful emphasis on the approach to immunization, carefully preparing parents and children for the experience, and educating them on the nature and value of the immunizations.

In Kansas distribution of immunization information is made through the schools. Kentucky's manual contains a helpful question and answer section intended to prepare the person giving immunizations for some questions commonly asked by parents. Maryland's immunization schedule places emphasis on health education of the family concerning the nature, need, schedule, and value of immunizations at the time they are given.

Nebraska has a manual for community leaders concerning immunization programs, and, for teachers, quite extensive classroom discussion guides on immunizations. New Jersey has a thorough manual on communicable diseases for its schools. Both North and South Dakota stress preplanned public education by many routes.

Puerto Rico has prepared immunization policies in Spanish. Vermont uses a Canadian leaflet printed in French for its French-speaking population. There are doubtless many other special considerations and measures taken to assure public education in various States, which did not come to this reviewer's attention.

Tuberculin Testing

Tuberculin testing is considered along with the immunization program in certain States. Idaho recommends tuberculin testing of children at age 1 and again at age 3. Iowa mentions routine tuberculin testing of children. Michigan advocates tuberculin testing of children at ages 2 to 3. Texas uses tuberculin testing in its well child clinics, but cautions against mass school tuberculin testing without adequate followup.

Discussion and Conclusions

The general impression gained in this comparative review of selected aspects of the immunization policies of the States and Territories is that some of the variation from one area to another is desirable and sensible, but much of the variation is needless and confusing. There should always be room for individualization of immunization programs, but there is no reason why there could not be more common agreement on standards of reference. The increasing use of the American Academy of Pediatrics report represents a trend in this direction.

One characteristic of immunization policies stood out. In virtually no other medical field have action policies been laid out with so little regard for citation of references or sources. In a sense, those States which have referred to the American Academy of Pediatrics report have cited authority, but the report itself (1952 edition) cites not a single reference to original studies. Apparently it has relied solely upon the organization's name to persuade the reader of the validity of the recommendations. Iowa, Kentucky, Oregon, Utah, and West Virginia present exceptions to this general observation, as they cite some references in their immunization policies. The manuals of Michigan and Pennsylvania are so thoughtful and thorough that they could not have been written without extensive knowledge of original studies, even though no references were made to such studies.

Massachusetts, with its own extensive program of original investigations of antigens and immunization schedules, occupies a unique position. Arkansas, with no facilities for original investigation, has felt a compulsion to cite the studies of others in justifying the current revisions made in its immunization policies and has embodied this bibliography in a question and answer manual on its immunization policies.

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technical publications

Research Grants and Fellowships Awarded by the Public Health Service in 1954

Public Health Service Publication No. 423. 1955. 70 pages. 25 cents.

This booklet lists alphabetically by State and institution all research grants and research fellowships awarded by the National Institutes of Health, Public Health Service, for the period July 1, 1953, through June 30, 1954. There were 2,855 research grants in the amount of $29,951,150 and 490 research fellowships in the amount of $2,132,004.

These grants and fellowships went to individuals in 372 institutions, located in 43 States, 2 Territories, the District of Columbia, and in 13 foreign countries.

Premarital Health Examination Legislation

Public Health Service Publication No. 383. 1954. 114 pages. 40 cents.

A compilation of the laws now in effect in 40 States and in Hawaii and Alaska, requiring a blood test and a physical examination for venereal disease as prerequisites for obtaining a marriage license, is contained in this publication. A history of the efforts to obtain enactment and an analysis of the effectiveness of such laws are included.

A copy of the law in effect in each State or Territory is reproduced with citations to the legal sources.

Studies on Household Sewage Disposal Systems—Part III

Public Health Service Publication No. 397. 1954. 134 pages. $1.00.

Part III of these studies includes data and findings on single and multicompartment septic tanks, sludge and scum accumulation, soil-absorption capacity, clogging characteristics of septic-tank effluent, effect of zeolite softener salts, effect of ground garbage and synthetic detergents on household disposal systems, evapotranspiration and plant growth, and investigation of various distribution devices, sludge and scum measuring devices, design improvements, and septic-tank "cleaning" products.

Parts I and II of this report dealt with studies on individual sewage-disposal systems conducted at the Robert A. Taft Sanitary Engineering Center (then the Environmental Health Center), in Cincinnati, Ohio, from November 1946 to July 1949. Part III continues from that point to the end of the studies in June 1953. The broad program of studies was financed jointly by the Housing and Home Finance Agency and the Public Health Service.

Poultry Ordinance, 1955

Public Health Service Publication No. 444. 1955. 37 pages.

This model ordinance prepared for use by State and local governments to supplement Federal regulations came about through close cooperation among the Federal agencies concerned, State and local health and agricultural authorities, and the representatives of the poultry industry.

The ordinance embodies the best available information on poultry sanitation at the present time. It will be revised as new experience or research indicate. The current issue was prepared with the assistance of a public health-industry committee.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Although data available do not permit an accurate appraisal of Navajo health conditions, mortality and morbidity rates appear to be unnecessarily high.

Health Conditions Among Navajo Indians

By J. NIXON HADLEY

THE NAVAJO Reservation, located at the only point in the United States where four States meet, occupies portions of Arizona, New Mexico, and Utah. It is a territory of about 25,000 square miles, approximately the same size as the State of West Virginia. It is an isolated territory, difficult of access. A major United States highway, No. 66, barely touches the southern border, and two subsidiary highways flank the reservation to the east and west. In between these, there are less than 100 miles of all-weather roads, according to a recent estimate (*1*).

The people whom we call Navajo call themselves *Dineh*, which means "The People." The name implies a feeling of self-sufficiency, a feeling which past history confirms. The Navajos occupy today approximately the same lands that they occupied before the arrival of Columbus. This occupancy has been continuous, except for 4 years' captivity at Fort Sumner in eastern New Mexico after their subjugation by the Army about 90 years ago. The return was at their own request, because of their desire to live their own style of life in their home country. After the return few contacts with the surrounding white people were available or desired. As a result, the majority of the Navajos, even today, do not speak English, cannot read or write in any language, and follow a culture pattern which is still basically Navajo rather than white-American.

The isolation of the Navajos began to break shortly before World War II. The tribe had increased steadily, from about 9,000 in 1868 at the return from Fort Sumner to nearly 50,000 in 1940. The reservation, although large in acreage, is an arid land that can support no more than 35,000 persons at a minimum subsistence level (*1*). Overgrazing by the sheep and goats needed to maintain 50,000 persons at even a starvation level was deteriorating the land still further. Reduction of livestock to carrying capacity of the range was essential to avoid its complete destruction. This program involved the Navajo families in new contacts with non-Navajos representing the Soil Conservation Service and the Bureau of Indian Affairs, and, since emergency relief programs were substituted for lost income from livestock, with the Civilian Conservation Corps, the Public Works Administration, and other agencies. World War II increased outside contacts. Nearly

Mr. Hadley, a statistician, is a staff member of the Indian Health Survey in the recently created Division of Indian Health, Bureau of Medical Services, Public Health Service. He was chief statistician of the Branch of Health, Bureau of Indian Affairs, Department of the Interior, from 1951 until the branch was transferred to the Public Health Service on July 1, 1955.

4,000 Navajos were in the armed forces, and wartime labor shortages brought about such active recruiting even among non-English speaking Navajos that 15,000 worked off the reservation (*1*).

At present the Navajos are well aware of the surrounding world. They look to it for trade and employment as a supplement to their inadequate land resource. With increased contacts, attitudes are changing in regard to their need for education, medical care, and other similar benefits. Nevertheless, at present the Navajo is described as "ill-fed, ill-housed, sick, and uneducated" (*2*), even though prospects for future improvement are encouraging.

Population Estimates

The members of the Navajo Tribe today probably number more than 70,000, but this figure is only a rough estimate. The last complete count was made in connection with the issuance of ration books during World War II. On the basis of this count, reports of vital events, and the United States census of 1950, the Navajo Agency estimates that in 1950 there were 69,000 Navajos who were residents of the Navajo Reservation or the adjacent allotted and public domain lands in New Mexico (*3*). The 1950 census could serve as only a partial check on the World War II count, primarily for two reasons.

First, the census recorded tribal affiliation of Indians only within the boundaries of major Indian reservations. Hence, it is known that there were 55,000 Navajos within the boundaries of the Navajo Reservation at the time of the census. Outside the reservation boundaries in New Mexico, there is a sufficiently large number of Navajos allotted on public domain lands to require that a hospital be operated at Crown Point for their benefit. Since tribal data are not available for Indians outside the reservations, the Navajos in this area cannot be tallied specifically, but the census reported about 9,000 Indians in this area who would be preponderantly Navajo.

Second, no allocation to place of residence was made in the census for migratory laborers, who were assumed to be residents of the place where they were found. As was indicated above, the Navajo has a strong sense of attachment to his home country, and, consequently, even though forced by economic need to off-reservation employment he will normally return to the reservation at frequent intervals. It is a matter of record that in 1950 there were about 8,000 Navajos working intermittently for the railroads but who were also maintaining residential ties on the reservation. It is estimated that about 2,000 additional Navajos were working in mines, timber lands, reclamation projects, and the like in areas away from the reservation. An unknown, but probably minor, proportion of these were permanent nonresidents of the reservation.

It is not possible to determine exactly how many of the 9,000 Indians reported from the public domain area are Navajos, nor is it possible to determine exactly how many of the 10,000 Navajos working on nonreservation jobs should have been, but were not, reallocated in tabulations by residence to the reservation. It would seem, however, that the estimate of 69,000 resident Navajos in 1950, including public domain allottees and persons engaged in temporary off-reservation employment, might be low rather than high.

Reporting of Vital Events

If the estimated figure for resident population is inaccurate, the main reason is to be found in the under-reporting of vital events. The test of birth registration completeness made in connection with the 1950 census throws some light on the problem of under-reporting. The test was conducted through the cooperation of the Bureau of the Census, the National Office of Vital Statistics, and the various State, Territorial, and independent city registration officials. It involved an attempt to match birth certificates with cards prepared by the census enumerators for all infants found by them who had been born during the 3-month period preceding the date of the census (*4*). For the six counties which include the Navajo Reservation, the birth registration test revealed that the names of less than one-half of the Indian infants born during the test period could be matched to filed birth certificates, according to unpublished tabulations prepared by the National Office of

Vital Statistics. This is an improvement over 1940, when less than one-fourth could be matched (*5*).

In considering the results of the birth registration tests as a measure of registration completeness among the Navajos, however, it should be remembered that they represent the degree of success in matching names between two records for an illiterate and non-record-conscious people whose culture allows for easy change of name. The same individual may be known on different records as Silversmith's Son, recorded in either English or Navajo; Tall Man, recorded in either English or Navajo; and John Jones. If the recordkeeper knows a little Navajo, the identity of the Navajo and English forms of the same name may be recognized, but only field investigation will develop the identity of the three independent variants. Consequently, although we know that out of about 600 names on the Indian infant cards prepared by the census enumerators in the 6 Navajo counties there were approximately 300 that were not matched to birth certificates, we do not know how many unmatched birth certificates also remained.

A basic assumption of the birth registration test was that the infants listed on the infant cards were a representative sample of all infants and therefore that the addition of infants not listed would not affect the proportions of registered and unregistered births. Thus, there was an implied assumption that birth certificates not matched to cards represent infants for whom no card was made. As indicated above, this is not a safe assumption for the Navajos because of their custom of using alternate names. A possible alternative assumption is that the infants listed on the infant cards were a representative sample of the ratio of medically attended births to total births, an assumption which provides a slightly different estimate of birth registration completeness among the Navajos.

According to the census enumerators' reports, 47.5 percent of the 638 Indian infants born during the 3 months of 1950 in the Navajo area counties were delivered by a physician (table 1). Registered Indian births within these counties during all of 1950 have not been tabulated by person in attendance, but nonwhite births have. Since there were only 70 non-Indian births among the 2,391 nonwhite births, the nonwhite births can be taken as representing Indians. According to the birth certificates filed for nonwhite residents during 1950 (*6*), 1,865 of the births were attended by a physician (table 2). If it is assumed, then, that these 1,865 births represented only 47.5 percent of the total number of births, the proportion reported by the census enumerators for the first 3 months, it can be estimated that there were actually about 3,900 total births during 1950, of which slightly more than 60 percent (2,391) were registered.

The 60-percent estimate of birth registration completeness corresponds moderately well with a 1944 estimate that about one-third of the births were not registered (*7*). However, the number of uncontrolled variants in all of these estimates is so large that about all that can be said with assurance is that a large but unknown proportion of Navajo births are not registered.

No data are available on the extent of underregistration of deaths among the Navajos. Since a considerable proportion of deaths occur in infancy and early childhood, it is assumed that an appreciable number are not recorded, but a percental measure of the degree of underregistration does not seem readily attainable.

Birth and Death Rates

The effect of under-reporting of vital events on Navajo birth and death rates is evident in

Table 1. Indian births during first 3 months of 1950 in Navajo area counties, as reported by census enumerators

State and county	Total number of births	Attended by a physician	
		Number	Percent
Total	638	303	47.5
Arizona:			
Apache County	186	97	52.1
Coconino County	106	38	35.8
Navajo County	149	72	48.3
New Mexico:			
McKinley County	119	64	53.8
San Juan County	50	30	60.0
Utah:			
San Juan County	28	2	7.1

Table 2. Registered nonwhite births during 1950 in the Navajo area counties

State and county	Total number of births	Attended by a physician	
		Number	Percent
Total	2, 391	1, 865	85. 0
Arizona:			
Apache County	631	491	77. 8
Coconino County	369	334	90. 5
Navajo County	502	342	68. 1
New Mexico:			
McKinley County	577	450	78. 0
San Juan County	273	229	83. 9
Utah:			
San Juan County	39	15	48. 7

every study that has been made of Navajo health conditions. Two recent studies made by the Bureau of Indian Affairs will demonstrate the point (*8*, *9*). These studies were based on Indian births and deaths by county as tabulated by the National Office of Vital Statistics. Rates were calculated on the resident Indian population as reported by the 1950 census. As indicated above, the census figures are probably an understatement to the extent of the number of persons absent as migratory laborers. If these persons were included in the base population, it would, of course, decrease the rates.

Without correction for underestimation of resident population or for under-reporting of births and deaths, the birth rate for the period 1949 through 1951 was calculated to be 32.7 per 1,000 resident population and the death rate to be 12.6 per 1,000 resident population. Both figures are lower than would be expected. The Apaches of San Carlos and Fort Apache Reservations of Arizona, one of the nearest neighbors to the Navajos, are reported to have a crude birth rate of 40.3 and a crude death rate of 19.6. The difference appears to be more likely under-reporting among the Navajos than any marked difference in actual conditions of the two groups.

Bearing in mind that rates for the Navajos are understated by an unknown but appreciable amount, a comparison of Navajo age-specific death rates with United States averages, as shown in table 3, is of interest. (The Navajo rates were calculated from National Office of Vital Statistics data as described above.) Even on an understated basis the Navajo death rate for infants and preschool children is 5 times as high as the United States average. The infant mortality rate per 1,000 live births for the Navajos is 139.4, also about 5 times the United States average. The death rates for children of school age are about 3½ times as high, and for young adults, more than 4 times as high. Navajo death rates markedly exceed the United States averages at those ages when deaths are preponderantly from communicable diseases or accidents, that is from the most readily preventable causes. In the older age groups, Navajo death rates are as low as or lower than the United States rates.

Causes of Death and Illness

The National Office of Vital Statistics has not tabulated deaths by cause for Indians in the six Navajo counties. The only cause-specific data available are those provided by the hospitals and clinics under the supervision of the Bureau of Indian Affairs. These data are still less complete than those in the tabulation above (which included all known deaths to Indian residents of the six counties), apparently covering about three-fourths of the deaths.

Without adjusting the data for under-reporting, they show that the three leading causes of death for the calendar year 1950 were tuberculosis, gastroenteric diseases, and ill-defined and unknown causes. Rates for these causes

Table 3. Age-specific death rates per 1,000 population for the Navajos, 1949–51, and the total United States population, 1950

Age group (in years)	Navajos	United States	Ratio
All ages	12. 6	9. 6	1. 31
0–4	36. 8	7. 5	4. 91
5–9	2. 1	. 6	3. 50
10–14	2. 1	. 6	3. 50
15–19	3. 9	1. 1	3. 55
20–24	6. 7	1. 5	4. 47
25–34	7. 8	1. 8	4. 33
35–44	6. 3	3. 6	1. 75
45–54	8. 9	8. 5	1. 05
55–64	13. 4	19. 1	. 70
65–74	27. 6	40. 7	. 68
75 and over	57. 1	109. 6	. 52

for the Navajos and the total United States population are given in table 4. The next three causes of death among the Navajos in 1950, according to Bureau of Indian Affairs data, were diseases peculiar to infancy, influenza and pneumonia, and accidental deaths. None of the three leading causes for the general population—diseases of the heart, malignant neoplasms, and vascular lesions affecting the central nervous system—was among the six leading causes for the Navajos.

Morbidity data for the reportable diseases are available for the calendar year 1953 from the same sources as deaths by cause, and it may be assumed that they are under-reported to at least the same degree as are deaths by cause. Even then, the case rates for many diseases are extremely high, as can be seen in table 5 (*10*).

Trachoma, a disease of negligible importance for the United States as a whole, is still one of the leading diseases among the Navajos. The rate for new cases not previously reported is nearly 600 per 100,000 population. Rates of more than 1,000 new cases per 100,000 population are reported for pneumonia and for tuberculosis. Rates for most of the common infectious diseases of childhood are high, particularly measles and mumps, for which rates are 2½ times the United States rates. However, scarlet fever and streptococcal sore throat are reported less than one-fifth as frequently as in the total United States population.

The major venereal diseases are reported about 3 to 6 times as frequently among the Navajos. No cases of the minor venereal diseases were reported, but in a population of less than 100,000 the probability of uncovering a case of a comparatively rare disease is not high.

Dysentery is over 10 times as frequent among the Navajos as in the total United States population, with a rate of about 150 per 100,000. This includes both bacillary and amebic dysentery. If data were available on the incidence of all gastroenteritis and diarrhea, hospital experience indicates that it would be one of the leading causes of illness.

Table 4. Death rates per 1,000 population for the three leading causes of death among the Navajos and comparable rates for the total United States population, 1950

Cause of death	Navajos	United States	Ratio [1]
All causes	9. 8	9. 6	1. 01
Tuberculosis, all forms	1. 9	. 2	8. 29
Gastritis, enteritis, and so forth [2]	1. 3	. 1	25. 65
Ill-defined and unknown causes	1. 2	. 1	7. 87

[1] Ratios calculated on basis of rates per 100,000 population.
[2] International List Nos. 543, 571, 572.

Table 5. Case rate per 100,000 population for 28 reportable diseases for the Navajos and for the total United States population, 1953

Disease	Navajos	United States	Ratio
Pneumonias	1, 137. 7	11. 2	101. 58
Tuberculosis, all forms	1, 042. 5	66. 2	15. 75
Measles	734. 3	282. 2	2. 60
Trachoma	581. 7	. 5	1, 163. 40
Gonococcal infections	553. 4	157. 6	3. 51
Syphilis	543. 1	96. 0	5. 66
Mumps	339. 8	126. 1	2. 69
Chickenpox	209. 8	202. 3	1. 04
Dysentery, all forms	148. 0	13. 3	11. 13
Infectious hepatitis	39. 9	21. 1	1. 89
Whooping cough	30. 9	23. 4	1. 32
Meningococcal infections	21. 9	3. 2	6. 84
Scarlet fever and streptococcal sore throat	15. 4	84. 8	. 18
Poliomyelitis, acute	10. 3	22. 7	. 45
Typhoid fever	6. 4	1. 5	4. 27
Trichinosis	3. 9	. 2	19. 50
Acute infectious encephalitis	2. 6	. 7	3. 71
Rocky Mountain spotted fever	2. 6	. 2	13. 00
Chancroid	0	2. 3	----
Diphtheria	0	1. 5	----
Brucellosis	0	1. 1	----
Malaria	0	. 9	----
Lymphogranuloma venereum	0	. 6	----
Granuloma inguinal	0	. 4	----
Tularemia	0	. 4	----
Botulism	0	0. 0	----
Anthrax	0	0. 0	----
Rabies in man	0	0. 0	----

Summary

Measurement of health conditions among the Navajos is hampered by lack of complete data either on the base population involved or on deaths and illnesses. Even with this lack of specificity, however, it is obvious that mortality and morbidity rates for most of the major dis-

eases are far in excess of the rates for the total United States population.

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Memorandums on Economic Poisons

In April 1955 the Technical Development Laboratories of the Communicable Disease Center, Public Health Service, made available its annual revision of the material on economic poisons. In mimeographed form, the memorandums are designed primarily for the guidance of physicians who are directly concerned with diagnosis and treatment of persons extensively or intensively exposed to insecticides.

Each clinical memorandum, after briefly giving information on the identity, formulations, and uses of a poison, discusses its toxicology with special reference to human cases, the dangerous dose in man, laboratory findings, and treatment. Each operational memorandum gives formulations and procedures for the control of the various susceptible insects or rodents that are of importance to public health. The chemical memorandums deal with the preparation of biological samples and their analysis for insecticides.

The revision contains separate clinical and operational memorandums on benzene hexachloride, chlordane, DDT, demeton, dieldrin, dilan, parathion, sodium monofluoroacetate (1080), TEPP, toxaphene, and warfarin. There are also clinical memorandums on dinitrophenols, kerosene, and xylene; and operational memorandums on aldrin, allethrin, ANTU, DDD, Diazinon, Dipterex, EPN, heptachlor, lindane, malathion, methoxychlor, Pival, and pyrethrum. There are chemical memorandums on DDT and lindane.

Persons who may have use for such memorandums may request copies from the Technical Development Laboratories of the Technology Branch of the Communicable Disease Center, U. S. Public Health Service, Box 769, Savannah, Ga.

PSYCHOLOGY OF AGING

Bethesda Conference

A conference to plan for research on the psychological aspects of aging was held April 25–27, 1955, at the National Institutes of Health, Public Health Service, Bethesda, Md., under the joint sponsorship of the American Psychological Association and the National Institute of Mental Health. Twenty-seven experts in the fields of psychology, biology, and sociology—many of them former leaders in child psychology—met to consider the most profitable methods for studying the aging process from infancy through old age. Public Health Reports presents in brief eight papers from the conference as representative of the five panels of the program.

Two Aspects of Adjustment

PHR brief

Members of this panel on the personal and social adjustments made by the aging person have fixed their attention on the adult years, from 30 or 40 to 60 or 65. They agree that adjustment has two aspects: an outer aspect, that of social adjustment, and an inner aspect, that of personal adjustment.

According to Kuhlen, external observers evaluate the social adjustment of a person in terms of his objectively measured capacity to function appropriately and efficiently in his dealing with the external world. Efficiency and performance on the job or status and functioning within a group, as viewed by that group, represent examples of social adjustment.

With respect to inner adjustment, Kuhlen believes that a person is deemed to be personally adjusted to the extent that he achieves a relatively integrated satisfaction of his various psychological needs; experiences a pleasurable sense of well-being, contentment, and relative freedom from unpleasant tension and anxiety; and is able to maintain this state of affairs by dealing with frustrating and threatening situations constructively and with a minimum of handicapping emotional stress.

Three papers are concerned mainly with personal adjustment, and a fourth—my own—deals with social adjustment. The papers on personality agree in using concepts which mean that a person who is well-adjusted is able to cope with a complex world. These concepts are: affective complexity (complexity of emotional reactions to a complex world), tolerance of ambiguity, flexibility, expansion. Indicative of poor adjustment are the concepts of rigidity, simplicity, constriction. None of the three papers attempts to set out explicit criteria for good adjustment, or successful aging, yet each one offers some implicit criteria of success.

Kuhlen writes of the "quality" of adjustment as dependent on the satisfaction of certain basic psychological needs, but his interest lies more in describing and measuring changes in personal adjustment during the adult years than in measuring quality of adjustment.

Peck describes some variables which clearly have a favorable meaning for adjustment, but he does not seem to be willing to postulate these as conveying the meaning of the term "successful aging."

Henry says that affective complexity and clarity of perception of available roles in the individual's social life space might be the major variables for describing personal adjustment. He concludes that these two factors are not seen as necessarily being definitive of the concepts of adjustment or successful aging but as providing an important empirical basis for subsequent study of persons independently judged successful or unsuccessful in respect to general life adjustment or to some specific life role.

Henry writes that all situations in adult life involve stress for the individual and that it is the manner of adaptation to this stress which constitutes the variable of greatest importance in successful living.

It might be useful for members of this panel to explore the extent of agreement and disagreement between Henry's strategy of studying the individual's ways of coping with the complexities and stress of the world and the proposals by Peck and Kuhlen that it is not so much the person's way of adapting to his life situation which is important but rather his retaining the offensive in his approach to life so as to maintain activity and expansion.

Another path for exploration is that of the techniques and the most useful combinations of techniques we can use in the study of adult personality.

Henry relies on projective techniques—the thematic apperception technique and the sentence completion test—which reveal the inner personality. Peck would use an intensive personal interview, supplemented by projective in-

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By Robert J. Havighurst, Ph.D., professor of education, University of Chicago. *As coordinator of the opening panel on research on personality and social adjustment, Dr. Havighurst in his paper summarized and commented on the papers of William E. Henry, Ray G. Kuhlen, and Robert F. Peck.*

struments, self-ratings, and interviewer ratings. Kuhlen uses attitude scales and other forms of self-report.

Still another question for consideration is that of the nature of the group of people to be studied. Normal people should be studied, we all agree, but should they be selected on a sample basis at random from the population or from certain social classes or occupational groups? Should they be volunteers who are happy to cooperate in our research, or should they be a randomly selected group containing those who are neutral or even hostile to our research?

Assessment of Aging

PHR brief

In both physiology and psychology, work on animals has made such extensive contributions that from the standpoints of theory and practice it is impossible to trace many significant generalizations to either area, so interwoven are animal and human studies. In the field of aging, however, interest is only now returning to animals after a lag of some 30 years. Yet animals with their short life span and great possibilities for control of conditions are ideal for aging studies. Calhoun examines this area in some detail.

One can say that every scientific problem on human beings at some point dips into the genetic background of the person. Even longevity varies with and within species and leads to the assumption of upper limit to the life span for the individual and the species.

Have we really modified that limit by our changing life expectancy, or has it remained substantially the same?

Kallman points out that there is a wide variety of other genetic problems within this general area. Studies of the genetic basis of aging are important both for understanding what happens to older persons and for the understanding of all life.

Underlying human behavior is the nervous system, which not only is our trigger, tracking and holding device, but also the integrator. Modern developments in the construction of computers and automation have given new insights into the range and variety of its functions.

Streicher shows that, although the changes in the aging nervous system are substantial and cumulative, their significance for behavior is not altogether clear.

Here is a link between Calhoun and Kallman. Genetic studies of aging in animal nervous systems along with experimentally introduced conditions and subsequent studies of nervous structures in animals offer much hope, not only as supplements to studies on human beings but also as ways of obtaining knowledge of fundamental relations.

If we consider the human being as a communication system which converts incoming stimulation into activity, the speed with which that system transmits messages becomes an important factor.

Birren's paper is devoted to this important problem. In a sense we are viewing the functioning of the nervous system from another angle. Perhaps the phenomena described by Streicher are reflected in the phenomena described by Birren.

Environmental Settings

Kleemeier's concern is with the effect of environmental settings upon the behavior and adjustment of older persons. This is a very large area with many psychological implications that have never been fully explored, yet millions of dollars are expended each year in the design of living arrangements for older people.

A multitude of problems of psychological moment have arisen in the design of institutions and homes for older people upon which a psy-

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By John E. Anderson, Ph.D., professor, University of Minnesota, and former director of the Institute of Child Welfare. Dr. Anderson, as chairman of the panel on the assessment of aging—background in theory and experiment, summarized papers presented by James E. Birren, John C. Calhoun, Franz Kallman, Robert W. Kleemeier, and Eugene Streicher.

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chologist should be able to give advice, but he finds little in the literature with which to answer the practical questions of the architect.

How many foot-candles of illumination should be provided for older people?

How thick should walls be to control noise?

What types of knobs and catches are easiest for old people to manipulate? Where should they be located?

What types of equipment and materials facilitate self-help? How do you teach an old person to learn to use the equipment?

We need to know both the optimal pattern, arrangement, or design, and how to bring the old person to adapt to it.

Another interesting problem of settings concerns the relation of design to findings in other scientific areas. To what extent should the design of living arrangements take into account activities and recreation?

Cataloging Changes With Age

It seems to me that many features of decline in older persons resemble aspects of growth in children. Decline like growth is neither uniform in all individuals nor for all processes and functions within the individual. Quite apart from pathological changes, variations in the rate and character of declines appear.

Much as in the earlier period of growth studies, we need to describe and plot these changes in a wide variety of structures and functions against time or age in order to catalog what occurs. Problems of the interrelations of these various declines then arise.

Is there an overall commonality in decline which can be used as a base from which to analyze the decline of particular parts or structures, or is it the summation of a host of specific declines?

There are also the problems of the point at which decline begins and the point at which it becomes crucial for the functioning of the part and of the organism as a whole. These problems resemble those of the initial and terminal points for growth.

In addition, we need detailed information on the effect of age upon the rate of recovery from insults and upon the rate of learning. Both of these involve specifically designed experimental studies, with care exercised to explore the phenomena at several scattered age levels since we need to know the age ranges over which such basic mechanisms operate.

In modern psychology there has been a movement toward so-called hypothesis research in terms of theoretical models and constructs. But in the study of living organisms such developments represent an advanced stage in the history of science, which appears only after a great wealth of descriptive, observational, and crude experimental data is available. From this point of view the scientific study of aging is still in the exploratory and programing stage.

Studies, then, of a variety of structures and processes made on cross sections of persons sampled by age and by other criteria from the population in ways that can be described with precision are badly needed. We find many areas of meager information on what seem to be simple and obvious variables. Our cataloging has been haphazard rather than systematic.

Neglect of Sampling

In contrast to the many well-designed studies at earlier age levels, we find masses of anecdotes, case studies, and surveys often presented without specific age reference. We find many studies in which individuals from 60 to 85 are grouped together without any age breakup of the data, yet no good basis exists for this grouping since we know that the change that occurs from 60 to 85 is tremendous.

We find much neglect of sampling. Some of the studies in the late 1920's set up better sampling controls than do more recent studies. To a much greater extent than in any other area, investigators on aging take whatever subjects are at hand. Often, even when available subjects are used, no attempt is made to define the sample in terms of such standard categories as education, socioeconomic status, and occupation.

Areas of Research

As the human being moves forward in time, he carries with him many functions and capacities which together make up his personality. We may well ask questions about the effect of aging upon different classes of phenomena in

order to envisage various research possibilities.

1. There are undeveloped capacities. Generally we assume that of the resources available at birth only a few can reach full potentiality because of the limitations of time and the high selectivity imposed by the fact that the person can only do one thing at a time.

We may well ask how long such capacities can be retained and how and when they can most effectively be activated? To what extent do they depend on other characteristics that change with age?

If the resources of an older group of persons could be explored and deliberate attempts made to develop particular capacities, we would learn more about holding mechanisms as well as about educability.

2. There are the emergency reaction mechanisms which are called into play when stress arises. In addition to the repair and learning mechanisms, these involve the emotional and motivating devices which underlie adaptation, adjustment, and problem solving in a very broad sense. We need data about age relations, the preservation of the mechanisms, and their interrelations with other functions.

3. There are the skills and knowledges of the person, the thousands of organizations of behavior in all degrees of complexity built up during his life and carried forward in some degree to later periods. Many are kept functioning by incidental practice. All have some degree of dependence on subordinate processes. They are affected by growing deficiencies in sense organs, muscles, in communication pathways, and in subassemblies.

4. There are the attitudes and value systems of the person, which are products of life experience that seem to be carried forward with even more stability than many of the skills and knowledges. We need knowledge about the origin and maintenance of rigidity and flexibility in the system as a whole, as well as in the various parts and functions.

Preservation of Function

Finally, I come to what I consider the most important research problem—the relation between use and activity and the preservation of function. The hypothesis may be formulated in general terms as "energetic activity accompanied by deep concern delays deterioration for a measurable time."

This proposition has both physical and psychological implications. On the physical side, there might be an optimal activity level for maintaining the best tone and greatest functional effectiveness in the bodily mechanism. On the psychological side, there might also be an optimal level of functioning for preserving tone and effectiveness.

The principle is related to a biological principle of greater extension, namely, that use both increases and preserves functioning and that in a living organism a minimal rate of interchange with the environment results in deterioration.

In considering this proposition it becomes clear that deterioration will ultimately come because even apart from pathological changes, the force which we call life runs down. But potentials under optimal conditions are probably far greater than we ordinarily assume. If we could throw out the cases in which there is failure of a specific organ or function and direct our attention to a group of essentially sound, normal individuals moving along their course, the basic principle would become clearer.

The practical importance of this proposition, if established, grows out of the fact that the amount of use of an organ or structure or of the organism as a whole is, within limits, under our control. For the organism without pathology, it is almost the only factor which is under direct control. Yet when we search the scientific literature, we find little direct evidence supporting or denying the principle. Our practical literature now makes the basic assumption that participation, interest, and activity contribute to health. But we seem to be just at the end of a period when precisely the opposite assumption that inactivity promoted well-being, seemed to be generally held.

Moreover, in the popular mind the myth of retirement and the general conception of aging seem oriented about the principle that absence of activity is both beneficial and preservative.

I would like to know whether human beings wear out or rust out and when the process starts.

I would also like to know how to preserve and increase effective functioning.

And I would like to know the answers not only in terms of organisms as a whole, but also for particular processes and functions.

The Aging Nervous System

PHR brief

Anatomical, physiological, and biochemical alterations of the central nervous system are possibly more intimately related to the behavioral aspects of aging than with almost any other single phase of psychology. However, the degree to which biological transformations modify the attributes of personality and mental ability remains largely unevaluated. The purpose of this paper is to highlight the major results of research on organic age changes in the brain, and no attempt is made to present a comprehensive review of the voluminous literature.

A number of distinct neuroanatomical alterations are usually encountered with advancing age. Brain weight and size are diminished by several percent, and the volume of the cerebrospinal fluid is increased. The dura mater is thickened and may contain deposits of calcium. Cell counts indicate loss of neurons accompanied by gliosis. Microscopically, changes include neurofibrillary thickening and contortion, deposition of argentophile material (senile plaques) of unknown origin, and the accumulation of pigmented substances (lipofuscin) composed of lipid and protein which may be derived from mitochondria. Anderson observed other histological transformations, such as hypochromatic staining of the Nissl substance, nuclear basophilia, and vacuolization. Although these apparently pathological alterations in the structure of the nervous system do not seem to have definite behavioral correlates, it is often assumed that advanced pathology of this nature is accompanied by functional deterioration. However, with very few exceptions, the mass of data recorded on this subject is qualitative, and as yet it is uncertain whether or not senile dementia is associated with the pathology of specific regions of the brain, such as the thalamus. Of course the modifications that are observed in the aged brain cell do not constitute presumptive evidence of altered neuronal function.

By Eugene Streicher, Ph.D., Section on Aging, National Institute of Mental Health, Public Health Service, Bethseda, Md.

Electrophysiological Changes

Certain electrophysiological changes, such as slowing of the alpha rhythm and elevation of the threshold to electroshock, have been definitely associated with the aged nervous system. The aged usually manifest several neurological deficits as reflected in sensory loss and the absence of reflexes such as ankle jerks. Little is known of age changes in neural integration and synaptic transmission although Birren has clearly demonstrated in rats that auditory and electric shock reaction times increase after 24 months of age. Since the electrophysiological characteristics of peripheral nerve are normal, it appears fairly certain that the increased latency reflects alterations in central synaptic and neurointegrative mechanisms.

It is the contention of some investigators that mental aberrations associated with senility are primarily the result of subclinical vascular impairment which affects certain sensitive cortical regions. This would imply that the psychosis accompanying cerebral vascular pathology has a similar etiology to that of senile dementia, except for the extent and locus of the lesion. Others maintain that these two conditions represent distinct clinical and pathological entities, although some degree of arteriosclerosis is usually evident in most autopsy material independent of the presence or absence of behavioral symptomology. It should be emphasized that the occurrence of systemic arteriosclerosis is not necessarily indicative of cerebral involvement since the process of vascular aging in the systemic and cerebral vessels is dissimilar. In the rat, there is little evidence of neurovascular pathology accompanying the aging process, and it is therefore an ideal animal in which to study

the aging nervous system without the complications imposed by vascular dysfunction.

As a rule the aged brain is more than normally susceptible to insult by vascular insufficiency. For example, therapeutic ligation of one common carotid artery in the older individual commonly produces a loss of consciousness. However, if the operation is carried out in a series of steps, syncope is often absent. Clinically, coronary insufficiency in an older person is sometimes diagnosed as apoplexy because of the predominance of neurological symptoms, and mental recovery is usually rather prolonged and may be incomplete. Cerebral blood flow is diminished with age, but only to about the same extent as the cerebral metabolic rate, that is, from 10 to 25 percent. It is still a matter of conjecture whether vascular pathology or neuronal loss is the primary cause of these effects.

Biochemical Changes

Changes in the chemical constitution of human and animal tissue with advanced age have been observed for a variety of substances. Increases have been reported in the levels of sodium, lipid, calcium, and iron, and decreases in the concentrations of ascorbic acid and potassium. The water content of rat brain diminishes with age although in human material both increases and decreases have been observed. Also, a decline in the solubility of tissue protein has been noted.

The oxygen consumption of rat brain tissue measured in vitro decreases after 2 years of age. (Approximately 50 percent of the animals survive to 2 years of age, and about 1 to 5 percent are alive after 3 years.) The data reviewed by Kety indicate that the cerebral oxygen consumption of unanesthetized male patients is approximately 10 to 25 percent lower in older subjects than in young men. However, the cerebral metabolic rate of "normal" old people and of patients with cerebral arteriosclerosis, or senile dementia, are essentially similar.

The rate of synthesis of neuronal protoplasm as a function of advancing age has yet to be determined although it is precisely this factor that is thought to be fundamentally implicated in the aging process. Thus the time required for the regeneration of sectioned nerves is prolonged in the 2-year-old rat.

There appear to be several rather profitable directions for research in neurobiological gerontology. The relationship of histopathology both to neuronal function and to behavior remains to be demonstrated. Progress in this sphere awaits the quantification of morphological data in terms of cellular loss, gliosis, and possibly alterations in the ground substance of the brain. On the biochemical side, major issues center about the rate and nature of enzyme activity and protoplasm synthesis in advanced age. Electrophysiological studies are also sorely required to evaluate the consequences of sensory impairment, synaptic interrelationships, and the efficiency of facilitatory and inhibitory mechanism responsible for neural integration.

The analysis of fetal and neonatal material at various ages constitutes one of the classic methods utilized by biologists to study structure-function relationships and to investigate the underlying mechanisms of cellular activity. At these early developmental stages there is a fairly good correlation between nervous structure and behavior. Unfortunately few of these investigations have been extended temporally to include mature and older material although

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"... what can I, upon the verge of my seventy-fourth birthday, with a shaking hand, a darkening eye, a drowsy brain, and with all my faculties dropping from me one by one, as the teeth are dropping from my head—what can I do for the cause of God and man, for the progress of human emancipation ... Yet my conscience presses me on; let me but die upon the breach."

—John Quincy Adams (1767–1848)

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the fundamental process of aging in cells has been studied by physiologists for almost a century. At the present time attention is focusing on these issues, not only because of the growing medical problems in this area, but also because of the unique basic biological information which can be elicited by such investigations.

Changes in Speed and Timing

PHR brief

The slowed reactions which are associated with the aging adult may be without apparent significance for the individual's social roles, esthetic values, or happiness. Yet, as a vantage point for exploring the nature of the changes in behavior and the aging nervous system, the study of age changes in speed and timing holds promise.

Speed and timing are important in survival. Even turtles or porcupines, which use a specialized form of passive defense, usually require a rapid timing of the defense reactions. The speed factor appears to be intrinsic to many types of activities. Individual differences in speed in the young adult may be largely a dependent variable in relation to motivation and other aspects of personality, but in the aging person speed or response latency (meaning the interval between stimulus and response) appears to be an independent variable for attributes of personality.

Status of Time Measurements

Time measurements may be a very sensitive indicator of minimal changes in skills and may be used to differentiate levels of ability wherein no errors are made. When we are learning a mental or manual skill, speed continues to improve beyond the stage of making errors, but when a skill declines, the speed or timing may be affected before errors are noted. Time measurements are likewise useful in describing behavior and also have conceptual potential in linking psychological and physiological phenomena of aging.

Despite convincing evidence of age changes in speed of response, the measurement and analysis of time differences have not been regarded favorably by many psychologists, presumably because they reflect adversely on the performance of older individuals.

In mental testing of the elderly, time measurement is often avoided because time limitations are regarded as arbitrary penalties against the older person. Such views are without experimental validity. Recent physiological studies suggest that measurement of speed of simple responses can be useful in assaying the mental status of aging individuals. A speed writing test, for example, differentiated more clearly between patients with senile psychoses and control subjects than did various combinations of standard mental tests.

Psychophysics and Aging

Research on aging has a deep concern with psychophysics by virtue of the kinds of changes which may occur with age in the relations of responses to properties of the stimuli. Psychophysics is concerned with relations between a physical continuum (stimulus) and a psychological continuum.

In general, the higher the intensity of a stimulus the greater must be the increase in intensity to be perceptible. The bearing of this relation to aging is seen in the results of Szafran. His findings that older persons benefit relatively more than the young from increased illumination prompt the question whether the age changes in sensory function are limited to the minimum energy required to stimulate or whether the whole range of discrimination has been changed.

In vision, it has been shown that the minimum light threshold is higher with advancing age. Coppinger's study in which he measured the flicker fusion threshold at three different brightness levels in young and elderly subjects

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By James E. Birren, Ph.D., chief, Section on Aging, National Institute of Mental Health, Public Health Service, Bethesda, Md. Dr. Birren took part in the panel on the assessment of aging.

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showed a smaller absolute increase for the elderly in threshold as brightness was increased.

This information can be used to equate stimulus intensities for young and aged subjects. If a stimulus is weak for an elderly subject, then presumably greater improvement will be seen in his judgments as the stimulus magnitude is increased than would be obtained in judgments in a young subject.

Speed and Difficulty

A question of concern to many psychologists is how the performance of the elderly differs from that of the young when tasks are varied in difficulty. The term difficulty is generally applied to the stimulus and is defined by the response. Thus, a difficult problem is one which takes a long time to solve and which has a low probability of being solved correctly.

Kay reports experiments in which he found that the speed of response for the elderly was more affected than that of the young when the distance between the response keys and stimulus lights was increased. He makes a strong plea for controlling task difficulty.

My associates and I have studied both the probability of a correct response and speed in simple addition of columns of digits of varying length. As the series of digits was increased, the probability of a correct response declined more rapidly for the elderly than for the young, and the time required changed relatively more for the young than for the elderly although the absolute increases in time were greater for the elderly.

In a similar study of verbal fluency and aging, we measured difficulty by the number of words in the category to be associated. As fewer words became available, the elderly showed a greater absolute increase in time but a lower relative increase than the young subjects.

In verbal fluency there is no external stimulus which must be perceived. The subject generates his own associations according to a criterion or set. Thus, since not all of the changes in response latency can be attributed to alterations in sensory perception, there is the suggestion that internal associations in normal thought processes may be slower in advanced age.

We can infer that even for easy or familiar material there exists a type of latency in the linkage of perception and overt response which becomes slower in the elderly. We might also ask whether there is any relation between the speed of doing a task of near zero difficulty and the rate of change in performance as difficulty increases. In aged persons there is reason to suspect that the initial constants of performance bear an important relation to performance at higher levels of difficulty.

Serial Movements

As a skill deteriorates it may again assume the quality of separate movements. There is evidence in Kay's experiments that older individuals have difficulty with timing of sequential tasks, but the role of the longer response latency in the sequence has yet to be thoroughly explored. In our own work we have seen that the handwriting of senile individuals tends toward a series of discrete movements instead of a smooth overlapping.

Timing appears to have a perceptual character—one "sees" or "feels" the right moment. If the serial elements of information follow one another too closely, the subject frequently does not respond. It is not known to what extent the discrete character of many activities is a result of altered perception.

Perhaps the study of age changes in humor in the adult years has been neglected from the viewpoints of timing as well as the kind of material which elicit laughter. This is an excellent field for a projective and neurophysiological study in which the content or meaning of events can be coupled with observations about how the content is handled by the nervous system.

Speed and Inhibition

Perhaps more common in daily life than the demand response of the reaction-time measurement is the situation where the stimulus is anticipated and received in advance of the appropriate moment for the response. Good timing is thus as much a matter of inhibiting a

response until the proper moment as it is a matter of facilitation. Before regarding the slow behavior of the older animal as adaptive, it should be recalled that the aged animal cannot react quickly under any circumstance. Similarly, the slowness of an aged person crossing the street is maladaptive.

A distinction is often made between the brain of man and lower animals on the basis of size and possible combinations owing to man's greater number of neurons. A functional progression might also be emphasized—as one ascends the phylogenetic tree, animals become more able to delay appropriate behavior without the behavior being forgotten.

There is considerable evidence for a longer latent period with increased age, but further work is required to verify the existence of a reduced upper limit of time beyond which the response pattern disintegrates. Responses from senile subjects suggest that if a relevant response is not evoked in some maximum interval the stimulus or task has to be reinstated in order.

The hypothesis is that an age change occurs in the latent period and also that the maximum time a response may be delayed is reduced. Within these time limits the older person is apparently less able to inhibit a response. The evidence for this change in inhibitory control ranges from studies of language and learning to negative functions.

A recent study confirms the finding that the senile are both slow in their responses and show less inhibitory control over their associations. This evidence prompts the question whether the variable is not one of a dominant priority of association based upon experience rather than inability to control or inhibit an overlearned association in deference to an appropriate one. Results of learning experiments, however, suggest that with advanced age it is relatively more difficult to modify an older response than to acquire a new one.

Altered inhibitory control appears to be a more important variable in the behavior of the aged than is the priority of past experience or reduced ability to learn. To avoid a paradox in explaining the data it seems necessary to adopt the view that the responses of the elderly are faster relative to their latent period.

Applying Our Knowledge

Perhaps we can make attempts to link results of mental tests, psychophysics, and neurophysiology by means of time and timing measurements. Knowledge of this kind may be applied for human benefit in three ways:

If defects associated with aging become clearly defined and localized, then particular environmental stresses may be reduced by engineering around the limitations.

In critical job performance, selection of personnel may be used to reduce particular stresses.

With adequate insight into the changes of aging it is likely that we can begin to develop social and biological prophylaxis to minimize the development of defects which are highly resistant to reversal once they appear.

The aged nervous system appears to be more determinate—the response tends to be a direction of the stimulus. There is, of course, the tendency to cultivate certain types of redundancy, that is, the social graces, and it is of interest that the social facade may be the last bit of behavior to disintegrate in a senile psychosis. The cultural pattern determines which areas of our behavior may be novel and which are expected to be predictable.

Cultural influences determine the sources and extent of motivations in the elderly. It may be a mistake, however, to assume that merely by raising the level of motivation, ability to learn always remains unimpaired. Thus, it is not easy to see why, if motivation is a dominant variable, elimination of errors for the elderly appears to be a more difficult process than acquisition of new responses.

Kay raises a most important issue when he questions the assumption of lower motivation as an explanation of the performance of the older individual. The assumption is tenuous that ability to learn remains unimpaired, whereas the motivation to learn declines, if only because of the difficulty in separating ability and motivation on an operational basis. Behavior is not infinitely plastic as evidenced by the persistence of patterns of neurotic adjustment. Further research should reveal information about life patterns which sustain plasticity of behavior with increased age.

The Intellective Functions

PHR brief

Members of the panel on perceptual and intellective abilities have discussed the strategy of attack upon problems of aging from several points of view.

Kaplan emphasizes the importance of comparative studies in normal and pathological groups, pointing to the need for more appropriate psychometrics, for better procedures in differential diagnosis, and for assiduous effort to coordinate psychological data with social, medical, and biological findings.

We do not know the extent to which psychotic deterioration has elements in common with normal decline. Kaplan makes the sound point that, until we have learned more about the nature of the senile psychoses, it is obviously unsafe to predict the ultimate role of psychology (or, he might add, of other disciplines) in the control of these disorders.

Mensch calls attention to gaps in our knowledge concerning the aging of sensory processes and touches on the problems in social perception and self-perception and their relation to personality. Perception is a topic of considerable current interest in the psychological laboratory but quite largely on the basis of theoretical formulations which ignore individual differences and age differences. Age changes in the sensory and perceptive processes should be examined in relation to physical and mental health and to experimental treatments such as in the hormone studies at Washington University.

Owens points to the need for environmental studies with older persons, as has been done for children. He would have studies of the influence of educational factors, the intellectual demands of an occupation, and the effects of the social environment in terms of social status or of rural versus urban living.

By Harold E. Jones, Ph.D., director, Institute of Child Welfare, University of California, chairman of the panel on perceptive and intellective abilities. Other members of the panel were Nancy Bayley, Oscar Kaplan, Ivan N. Mensch, William A. Owens, and L. L. Thurstone.

Need for Longitudinal Studies

All three agree as to the special need and unique value of longitudinal records. This rarely practiced approach is strongly advocated by Bayley, who emphasizes the need for obtaining information about individual differences in growth patterns.

Growth in both mental and physical traits may occur in many different channels and with idiosyncratic changes in rate. These changes are partly psychometric, owing to changes in test composition, and partly environmental. To some extent, however, they reflect an intrinsic patterning which cannot be predicted from a study of the external environment.

Individualities in growth may constitute long-term trends, as in the slower rate of mental growth of the feebleminded, or short-term variations which have been conceived as related, to some extent, to the less adequate homeostatic mechanisms of early childhood. But the later years may also be marked by idiosyncratic changes, which can only be traced and related to antecedents if observed as phases of a life history.

Current Studies

Bayley and Oden, in their study of a university group with extremely high ability levels, have shown that the gain in mental test score within an age range in which a decline is usually registered may be attributed partly to the high degree of selection in the sample and partly to the nature of the tests, which were essentially vocabularly tests (analogies and synonyms-antonyms). The hypothesis may be offered that at the extremely high ability levels of this group, the analogies test presents a mental task chiefly discriminating with regard to the knowledge of words.

In reviewing the work Conrad and I have done with a rural group, I have shown that while the information and opposites tests resist age decline, the task of analogical thinking becomes increasingly difficult in this sample, apart

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from changes which can be attributed to speed of reading.

Owens has found significant gains in several mental functions between the ages of 19 and 50. Since many studies have shown continued improvement in mental test scores during the years in college, possibly these gains were due chiefly to the fact that testing started before the end of adolescent mental growth. The growth from 19 to 23 in some functions perhaps was sufficient to mask an actual decline in the later decades. Special interest attaches, however, to the fact that for those retested at 50 the average alpha score was at about the 70 percentile of the scores at age 19, whereas for the same age interval in the same test Conrad and I found a decline of almost the same amount. To me this implies that the differences between our results and those of Owens are chiefly an expression of the age increase in variability, which is found in so many aspects of physiological and psychological functioning.

Owens offers two possible explanations of increasing individual differences: the cumulative effects of differential decline at different ability levels and the influence of organic impairments at all ability levels. It is not clear that the latter would significantly increase variability in intellective functions unless the weight of impairment were greater at the lower levels.

Among children, the correlation between intelligence and measures of health or of freedom from physical handicap is nearly always found to be positive but too low to suggest an important degree of interaction. Over the decades, however, the cumulative effect of this relationship may deserve greater consideration, particularly when the decline in homeostatic functions makes it more difficult to resist the persistent and increasing drag of other impairments.

Renewed emphasis should be given to the necessity of studying the positive aspects of age changes, as well as the characteristic age losses. It is not realistic to expect that mental functions will be immune to the age changes which occur in other processes. But the role of intellective abilities in social and occupational adjustment may not be the same at different ages. With diminishing mental speed and power, greater support may be enlisted by some individuals from the reserves of skills and knowledge created through experience and from superior work habits. We need more information as to the conditions under which these reserves are best brought into play. At the highest levels of creative endeavor, it is probably rare for compensating factors to operate effectively beyond the middle years of life. But in more routine tasks, of possibly great social importance, the decrements in ability may for a long time be more than matched by increments in other work factors.

The study of these positive features of performance in later life deserves more attention than it has received in the past.

Education of the Aging

PHR brief

Many of the studies since Thorndike established the fact that older people can and do learn have been concerned with showing how they learn and particularly in what way their learning differs from that of younger persons.

These studies have shown that the learning of older individuals, as compared with that of younger adults, is characterized by a decreasing gradient of efficiency, as expressed in both errors and time scores, a greater use of habitual pattern of response, a more concrete approach to test tasks, a tendency toward feeling of inferiority in learning situations, a beneficial effect from recent practice in learning and recall, and a difference in ability to remember verbal rather than abstract materials.

Application of these findings would allow for some definite modification of educational techniques to take account of the special characteristics of the learning process in older adults.

By Wilma Donahue, Ph.D., chairman of the division of gerontology, Institute for Human Adjustment, University of Michigan, and a participant in the panel on learning, motivation, and education.

Some further investigations are indicated, however, before present-day knowledge is crystallized into an educational psychology for later maturity. Among the questions needing further study are some related to selection of test populations and to learning ability and education of older adults.

Selection of Test Samples

The older adult group is not homogeneous. It consists of at least two subgroups: those who are to be classified as the aging and those who may be considered to have become definitely aged. It is particularly undesirable to lump these groups together in a single group, 50 and over, or 60 to 80, when considering the psychological effects of aging.

In the first group, the normal processes of senescence are not so profound as to have seriously changed the functionality of the individual. He is still coping effectively with his environment, still able to concentrate long enough and well enough to carry out instructions in test situations.

For the second group, degeneration may be assumed to be quite widespread; the individuals are apt to show symptoms of confusion, disorientation, and inability to continue independent living; or if they manage to maintain themselves, it is at great personal effort. In test situations, they tend to lose the set and to forget instructions before the task is completed.

In selecting samples of older adults for study, careful consideration needs to be given both to the use of criteria which will discriminate the aged from the aging and to other factors such as education and intelligence.

Other variables which should be considered are those of occupation, health, motivation, recency and extent of practice in skills required by the test, and environmental conditions in which the test is performed. Only when such variables are controlled can comparisons be made between different age groups with assurance that the individuals compared are equated on points effective in determining test scores or performance. The investigators who have been careful to equate some of these variables are the exception, and many studies need to be repeated under better and more controlled conditions.

Learning Studies

The classic studies of Miles, Jones and Conrad, and Foulds and Raven have produced age curves with the same characteristics as the one described by Thorndike: a rapid rise to a peak efficiency in the twenties, then a slight down gradient for the thirties and forties, followed by an acceleration of the negative gradient. The shape of the curve remains essentially the same regardless of the nature of the material learned, but the magnitude of the change depends on the type of material learned.

Perhaps past studies have been definitive enough to establish the fact that age brings disablement in learning ability, but there are a number of further investigations which appear to be needed before such a conclusion is adopted unequivocally.

It is possible that the shape of the learning curve, based as it is on studies of groups of subjects of different ages, does not necessarily represent changes in the ability to learn with advancing age but may reflect the early onset of degenerative processes in a significant number of subjects.

Lack of criteria for measuring the early senescent changes may make it impossible to avoid an adverse effect on the average test performance of the age group. However, with the new Wechsler intelligence scale, it should be possible to select a group of the most effective oldsters in comparison to the norm for their peer group.

Investigators who have compared a younger with an older group of superior and presumably undeteriorated men usually show the older group to be definitely handicapped by what is assumed to be a slowing down of the mental processes. This conclusion, however, should be looked at carefully from the point of view of the attitudes and qualitative differences in the approaches of older learners as compared with those of younger ones.

For reasons known only by speculation, the older person approaches a learning task with a considerable feeling of inferiority, especially if he knows that his performance is to be compared with that of younger learners. Camp concluded that an older man does not differ from a younger one in his memory for recorded events or in his ability to learn but that inferi-

ority feelings constitute an emotional handicap to his learning.

Another study which illustrates the insecurity which older people feel when required to learn is that reported by Welford. He found that subjects in their twenties seemed to approach the learning task without any clear idea of what they were going to do and allowed the task to dictate their method while subjects in the thirties, forties, and some in the fifties and sixties asked questions about the methods of learning they should adopt before beginning their first trials. Apparently they felt the need to evolve a technique before beginning to work and hoped thereby to perform more intelligently.

Other interpretations, however, can be placed on the behavior of these older subjects. It may represent an attempt to apply some habitual type of solution to the new problem, thus avoiding the exertion of new learning. It may indicate less fluidity in thought processes than those of younger people, thus causing the older learner to take a more concrete approach to the problems. But it may be equally plausible to assume that the longer experience of older people has taught them the disadvantages of error and the advantages of succeeding in competitive situations, thus invoking some negative feelings toward any learning situation.

When the older student frankly adopts the eagerness for learning found among younger people, he frequently excels his younger classmates. But when he is defensive and fails to accept an exploratory learning approach, the experience is likely to be one of great frustration and emotion, and one which no amount of application can overcome. Studies are needed which will make clear the extent to which the difficulties of older people in learning are those resulting from changes in ability and to what extent they are the effects of experience and unfavorable attitudes.

Effects of Practice in Learning

Lack of practice in learning may account for some learning disability among older adults.

Thorndike, like the doctor who prescribed digestion as the best cure for indigestion, suggested that adult learning is probably a partial cure for adult inability to learn.

Sorenson, undertaking to test the theory that disuse—as expressed by the absence from methods used in acquiring information for university study—is the explanation for apparent disability in college courses with advancing age, reported that the slight disability of those who have not been engaged in vigorous learning for a period of several years can be overcome by resumption of study.

Further studies are needed to determine to what extent the renewed ability to learn and remember accruing from classroom experience can be transferred to the more casual living situations:

Must practice be provided in all types of learning, or does the training in learning one type of material serve as an antidote to difficulties in learning other kinds of material?

Is the improved ability to learn reflected in increased mental alertness in other situations?

How much learning must take place in order to restore the ability to peak level of efficiency, and how much must continue to take place to keep it there?

Do the various levels of intellectual ability respond to practice in adult learning in the same way, or is practice necessary only for the less able?

Education of Older People

Few studies have been made as yet to determine the teaching methods and course content most useful in training older people. At present we must rely on known effective methods for children and youth. These may not differ greatly from methods which will be found to be most effective for older learners, but some adaptations undoubtedly are required.

Anderson says that young people and older adults improve performance with continued practice under motivation. Both start learning a task ineffectively and gradually attain expert skill. Both respond in the same way to skill of teachers, use of audiovisual aids, dramatic presentations. Both are strongly influenced toward learning by what their contemporaries do.

He also described differences between the two

age groups. The older individuals bring an accumulation of experience to the learning situation which may help or hinder the new learning. They are more concerned about the effects of their errors. They are more difficult to motivate and less willing to learn for the sake of learning.

Studies of motivation of older people to participate in any task or program are among the most pressing of today's needs. Literally, at present, much more is available to older people in the way of education, recreation, health programs, and so forth, than is being used by them. The task is how to motivate the aging person to want to take the initial step required to become a member of such groups and programs. The problem is complex and needs to be broken down into its several components.

Some of the difficulty lies in our lack of knowledge about how to communicate with older people. We know very little about how information reaches them, what channels of communication are open to them, and what relative values they place on different sources of information. Although radio listening and television viewing are common among the group, the effectiveness of the participation of the older person in this type of communication is practically unknown. Further, the extent to which information gained in this passive fashion can be expected to result in action is also still to be determined.

There is considerable resistance to participation in educational activities because older people do not feel that it is permissible for them to go to school. It is not until deeper understanding of the need for continued creative expression comes about that many older adults will take part willingly in learning activities. How to change attitudes of this type constitutes an important field of research.

Studies on the motivating values of different factors such as methods for presenting stimuli, knowledge of results, active versus passive participation, timing repetitions, reinforcing experiences, reward and punishment are needed as a basis for making adaptations in teaching methods and for inspiring adults to set and attain new levels of aspiration.

Education for aging is to be looked upon as the new challenge. Psychologists have a responsibility for determining the ability of adults to learn some of the things needed for the enjoyment of leisure and for determining methods for teaching and involving the adult in learning situations in order that new techniques for creative experience may be gained. The educator is faced with the challenge of applying his knowledge to the requirements and proper teaching of adults so that they may have the opportunity to pursue the stimulating aspects of life into old age.

Skill and Employment

PHR brief

My assignment is to try to indicate what we need to know about the organism as an efficient unit in relationship to aging. Of particular concern is the organism's essential goodness in terms of productivity.

Herein lies the implicit assumption that we ought to be able to assign some characteristic number to an individual which would serve as an index of his aging status much the same as the IQ is taken as a measure of intellectual capacity. While this represents an ideal, it is based on the assumption that there is some common factor involved in aging.

From a theoretical point of view, this is an important research problem. I see no reason why we should not attack it on a broad front much as we have approached the isolation of factors involved in other performances. We could apply a wide variety of performance tests to individuals over a wide age span and then see what common factors could be isolated from test results.

As I see it, until we have access to cooperative subjects in large numbers—with the active col-

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By Nathan W. Shock, Ph.D., chief, Section on Gerontology, National Heart Institute, Public Health Service, Bethesda, Md., and visiting physiologist, the Baltimore City Hospitals. His brief is from the panel with the same title.

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laboration of many research people and industry—we are going to be handicapped in describing age changes in performance. Since it appears that age changes are often related to reserve capacities, it is essential that any test batteries include measurements made not only under resting conditions but under conditions of measurable stress and displacement.

In addition, there is also the practicable problem of what older people can do. This is within the province of institutes of industrial relations and the research activities of private industries. A detailed job analysis, in order to determine the skills and conditions required for performance of these jobs, is an essential first step. Then would come an evaluation of the specific types of performance within aging workers, with the hope that ultimately requirements of the job and the capacities of the worker could be adequately matched.

Our laboratory (operated in collaboration with the Baltimore City Hospitals) has been interested in the problem of human performance for a number of years but has placed major emphasis on the physiological aspects of the problem, with an attempt to evaluate specific performance of organ systems as well as that of the total person. All I can hope to do is to present a few broad generalizations with respect to age changes in performance and to indicate questions which need further research.

Factors Affecting Performance

Let us examine briefly some of the physiological limitations of performance that change with increasing age. When we are dealing with the human animal, the question immediately arises as to whether changes in physiological functions are due to disease or whether they can be regarded as the effects of age alone.

As I see it, we are interested in the performance of aging people, and if disease is an inherent part of the older organism, it will have to be accepted as such.

If we were able to study large numbers of individuals selected at random from the total population, we would not necessarily need to exclude subjects on the basis of medical examinations. However, when we choose subjects from an institution, we need to exclude subjects with identifiable disease because the incidence of disease may be greater than in similar subjects living in the community. Thus, the research method and design depend on the population under study. Therefore, the first essential for effective studies of aging is the identification and description of the population under observation. Unfortunately, this has not always been done.

It is obvious that sensory changes may have an important bearing on performance. Rather extensive studies have shown that hearing for particularly high frequencies diminishes with increasing age. Studies on vision also show that the range of accommodation, visual acuity, rate and level of dark adaptation, pupil size, and the rate of flicker fusion frequency show a gradual impairment with increasing age. Vibratory sensitivity gives some indication of similar decrements with age. The problem of age changes in sensitivity to pain still awaits systematic investigation, owing largely to a lack of an acceptable objective measurement of pain.

Sensory changes associated with aging could serve as valuable indexes of the overall rate of aging in the individual even though they may be adequately corrected so that performance need not necessarily suffer. This also is a problem which has not been solved.

Of even greater importance to performance is the question of perception and the ability to extract information and utilize it in terms of behavior. This is a question which has received relatively little consideration from students of aging but for which extensive techniques have been recently developed by the Armed Forces.

The problem is one of determining the individual's ability to receive information presented simultaneously from a variety of sources and to abstract the information which is pertinent to specific performance. It would seem that this type of activity is one in which elderly people might show significant changes.

There is little doubt that the speed of performance diminishes with increasing age. This decrement in speed shows itself in studies of simple or complex reaction time, in speed of muscular movement, in psychological performance, and in even more complex performances included in many tests of intelligence.

Although Miles has demonstrated that reduction with age in performance includes both perceptual and effector processes, there is no information on the effects of age on the rate of performance of isolated muscle groups. Nor is there any information on the interrelationship in the same individual between speed of performance on different types of activity although a broad generalization would imply a relationship.

Welford, experimenting with the conceptions presented by Bartlett, has provided some evidence to indicate that simple measurements of the total time required for a given response should be supplemented with observations on the detailed segments of the total performance. Within this framework he has demonstrated significant age changes which otherwise would have escaped detection.

When we examine the performance of specific organ systems within individuals, we find a variety of age changes. Some systems show little evidence of functional alterations with increasing age. This is particularly true of measurements made under resting conditions where a number of physiological processes are involved in maintaining a stable equilibrium. However, under circumstances of physiological stress, age differences may be observed. For example, the rate at which the blood sugar is restored to resting levels, after the intravenous administration of excess glucose, diminishes significantly with increasing age. Similarly, the administration of an acid or an alkali requires more time in the older individual to readjust the acidity of the blood than in the young.

In other organ systems there is evidence of the reduction in function even in the resting state. For example, the amount of blood pumped by the heart, as well as the amount flowing through the kidneys, shows a gradual reduction as age increases.

Thus, our physiological studies have indicated that with increasing age there is a gradual reduction in reserve capacities and in the effectiveness of interorgan system correlation. A finding common to all these measurements is that the rate or speed of readjustment is diminished in the older individual.

We may well question the assumption that the rate of metabolism of individual cells diminishes with age. While it is true that the basal oxygen consumption, taken as an index of overall rate of metabolism, diminishes gradually with increasing age, we cannot assume that this is a reflection of the rate of metabolism in individual cells. This is because with increasing age there is a gradual dropping out of functioning cells from various organs and tissues and an accumulation of body fat which does not contribute to metabolic activity. The apparent diminution in metabolism might well be a reflection of this change in functioning protoplasm and an accumulation of inert substances.

Our laboratory has attempted to relate basal oxygen consumption to a measure which might be more representative of the total amount of functioning protoplasm in the body. For this purpose, the total water content of the body, as measured by antipyrine, has been utilized. When the oxygen consumption per unit of body water is calculated for each individual, it is found that there is no decrement with increasing age.

When we turn to studies made on cells and tissues for an answer to this question, we face disappointment since relatively few studies on really old animals have been carried out and since no estimates of the number of cells remaining in the tissue slice, for example, have been made.

The effect of age on the ability to perform physical work has not been investigated extensively. Robinson's studies indicated that older people were unable to increase their pulse rates as effectively as young in response to exercise but did not find significant differences in oxygen uptake.

Similarly, Norris in our laboratory has found no difference in the efficiency of old versus young subjects performing standardized amounts of arm exercise. We do know, though, that older people are less able to perform heavy work and that their rate of recovery, with respect to pulse rate, respiration, or oxygen uptake, is diminished.

We also know that there is a gradual reduction in muscle strength and endurance in the higher age categories. Whether this diminution in muscle power is a result of loss of muscle cells, or whether it is more functional in nature

and comparable to an atrophy of disuse, is still an open question.

We do know that older individuals require a greater turnover of respiratory air in order to obtain a given level of oxygen uptake under conditions of exercise, but whether this is a respiratory impairment or can be ascribed to alterations in the capacity of the heart to pump blood is still another open question.

Although the mechanical efficiency of old and young is indistinguishable at moderate rates of work, at both low rates of work as well as at maximal rates of work, the mechanical efficiency of the older individual is impaired, Norris has observed. This opens an interesting point for investigation since the low efficiencies at slow rates of work in older people were completely unexpected.

It is possible that this impairment of efficiency is a reflection of poorer muscle coordination and impairment of neuromuscular control. Since the physical requirements of most jobs are minimal, the question of maximum workloads that older people can perform is of relatively little importance in problems of employment. Of greater importance is the question of endurance and the effects of repetitious tasks. This is a question which has not been systematically investigated on an agewise basis.

Occupational Roles

PHR brief

The dynamics and interrelationships of occupational roles, health, and aging comprise one of the crucial problems of gerontological research. Gerontologists in general would accept as reasonable the hypothesis that occupational roles and health are significant independent variables in relation to the social psychology of aging.

In the chronologically advanced years of life, especially for men, aging as perceived by oneself and by others is largely a function of withdrawal from making a living and of decline in state of health. Research shows that people of 60 and over who are occupationally active and in good health are younger in their own eyes and in the eyes of others than are those who have withdrawn from the labor force and are in poor health.

Somewhat less success has been derived from efforts either to establish or to interpret the relationship between occupational roles and health in old age. Most, but not all, research findings in this area show a positive correlation between the two variables.

Even if our findings were consistent, we would still be confronted by the problem of the meaning of the correlations. Which of the two variables is independent, and which one is dependent? Some claim that occupational roles are independent and that health is the dependent variable. Others argue that health is a predisposing factor rather than a consequence of occupational roles.

A tentative resolution to this controversy lies in the following compromise stated by Mathiasen:

Persons who die soon after retirement in all likelihood are succumbing to physiological conditions which would have caused death whether they had retired or not, but this does not rule out the possibility that retirement shock may precipitate an occasional fatal cardiovascular accident. It is difficult to estimate the effect of the sudden cessation of work on health in the absence of any techniques for measuring quantitatively the effects of emotional disturbance on health or for separating precisely the psychosomatic disorders from organic disease.

We may be inviting continuing frustration if we persist in taking an either-or theoretical position even in this modified compromise. For there is an inherent limitation in assuming that occupational roles and health are related to each other exclusively as independent and dependent variables in a yet unknown pattern. It may be more rewarding in the long run to consider them as interactive partners in a re-

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By Milton L. Barron, Ph.D., associate professor of sociology, City College, New York. Participating in the panel on skills and employment, in addition to Dr. Barron, were Ross McFarland, Josef Brozek, Charles Odell, and Nathan Shock.

ciprocal relationship. Each probably acts and is acted upon by the other although not with equal influence.

Misplaced Research Emphasis

Gerontologists working on the problem of occupational roles in old age seem to assume that the transition from employment to retirement is the crux of difficulties associated with occupational roles. Yet research findings indicate that the unemployed aged who do not consider themselves to be retired have more acute economic, psychological, and social problems than do the unemployed aged who do consider themselves to be retired.

The reluctantly unemployed in our older population deserve far more attention from researchers than they have been given. Unwilling to tolerate the economic idleness to which they have been relegated, this group has the most emphatic minority-group reactions of all occupational groups among the chronologically aged.

Some of our findings definitely suggest that we have been concentrating on problems of physical health when we should be studying more intensively the problems of mental health. Physical ailments in the older population are not as severe and widespread as they are generally reputed to be.

The relatively little gerontological research on mental disorders in later life indicates that they are more extensive than problems of physical health. The Cornell University survey revealed that the majority of the urban older people are troubled some of the time by psychosomatic symptoms, nervousness, and forgetfulness. Much more needs to be known about the social and cultural bases of the major mental disorders of later life.

Social Science Concepts

The time is overdue for more utilization of relevant social science concepts and theory in gerontological research on problems in mental health as well as other problems of aging. Studies have already intimated that the kind of social relations in which older persons participate is a crucial factor in the etiology of their mental disorders. These social relations are fruitfully characterized by orthodox social science concepts such as Durkheim's "anomie," Jung's "loss of significance," and Faris and Dunham's "isolation."

The theoretical framework basic to much contemporary social psychology seems to be adaptable to gerontological research on problems of mental health. This framework implies that the social self not only embodies the group's normal attitudes but also the frustrations and confusions of the group. Society's tensions and cultural contradictions contribute to the conditioning of the self. When the self is mentally and emotionally disordered as well as physically ill, the family, the neighborhood, and society itself constitute a considerable part of the etiology.

The attention of gerontological researchers should be drawn to other potentially relevant concepts and theoretical schemes of social science as well:

Does the self-fulfilling prophecy have any bearing on the dynamics of occupational roles and health in old age?

Can we hypothesize that expectations of morbidity and mortality in old age are intensified by retirement so that they become self-fulfilling prophecies expressed in hypochondria and functional symptoms of illness?

To what extent does psychological unemployability account for the difficulties of the unemployed aged who do not consider themselves retired in returning to gainful employment?

Is unplanned, involuntary, and abrupt retirement the kind of experience meant by the concept catastrophic reaction?

The need-for-illness concept is another social psychosomatic tool with gerontological possibilities. It describes a condition which is an outgrowth of repeated frustrations in the individual in attempting to handle complicated problems. The person does not consciously seek illness as an escape but rather the care that one receives in illness, the kind of care that corresponds to the maternal love given a child who has met difficulties.

Middle-Class Norms

A pitfall to be avoided is the indiscriminate gerontological usurpation of concepts and the-

oretical frameworks from a heretofore youth-bound social science. More than an imminent danger, possibly an actuality, is the heavy reliance of research on middle-class norms. Are the concepts adjustment, social satisfactions, and avocational interests truly free of restrictive class connotations?

There is some basis to the suspicion that educators, scientists, physicians, clergymen, and industrial and business personnel—typical middle-class sources—have played a more influential part in defining the problems of aging and introducing these norms to an age status in urban industrial society than have the representatives of other social classes.

This suspicion is reenforced by our observations of the negligence of older people in preparing for retirement. Many of the norms for such preparation are implicit in hobbies, travel, avocations, and club sociability, for these activities offer more appeal and meaning to older people of the middle classes than they do to those of lower economic, social, and educational strata.

Relevant here is Noetzel's observation that in some counseling programs, foreign-born and semiskilled manual workers react negatively to any discussion of hobbies. To them the word connotes "make work," childishness, or futile play. This becomes especially significant in the face of evidence that older people in our society are geared socially toward the working classes more than to any other social strata. The Cornell survey found that the majority of its respondents considered themselves to be members of the working classes. Furthermore, the formal education of the sample was geared toward the lower level of cumulative years of schooling.

Gerontological research on the dynamics and interrelationships of occupational roles, health, and aging obviously cannot rely completely on concepts and theory already available in the social sciences. There is need for new, imaginative theoretical formulations; for example, the typology recently put forward by Riesman for analyzing materials gathered in the Kansas City study of middle age and aging.

Riesman points out that reaction to aging in the United States is largely governed by norms that vary according to social group. Not only do we need to recognize the substrata among older people, we must also adapt norms to the various substrata.

Medical Problems of Atomic Warfare

Medical problems facing the military services and the Nation in an atomic war will be presented at the 3-day program of the Association of Military Surgeons of the United States, meeting in Washington, D. C., November 7–9, 1955, for its 62d annual convention.

Topics will include the medical effects of nuclear warfare; care of mass casualties, such as protective measures, initial aid and rescue, and treatment of large numbers of blast, thermal, radiation, and neuropsychiatric casualties; and organizing the various medical and technical specialists and facilities for managing thousands of casualties at one time.

Scheduled for addresses are the Chairman of the Atomic Energy Commission; the Assistant Secretary of Defense (Health and Medical); the Surgeons General of the Army, Navy, Air Force, and the Public Health Service; medical chiefs of the Veterans Administration and the Federal Civil Defense Administration; and representatives of the medical industries.

Major Causes of Illness and Death

Morbidity investigations usually study disease characteristics such as the distribution of cases by diagnosis, by age and sex, by season of the year, by acute and chronic manifestations, by severity in such terms as nondisabling, disabling, confinement to bed or to a hospital, and by the case fatality.

Many health workers are interested in the illness of different groups of persons rather than in given diseases. Age groups from infancy to old age differ a great deal in their illness patterns, and this paper is an attempt to show graphically the most frequent causes of illness of varying severity and of death in each of six age periods from preschool to old age. Needless to say that the causes of illness and death differ greatly as between early infancy and old age, although these two age periods have the highest death rates.

A separation of illness into acute and chronic diseases gives a picture of moderate but declining rates of acute illness in the preschool and early school ages, and of increasingly higher rates of chronic diseases as age increases. Carried to early infancy, this situation means extremely high death rates for the very young as well as extremely high illness and death rates for the aged, whose vital organs have degenerated over the long period of continuous functioning.

The major causes of illness and death at the different ages are not discussed in this summary, but the study includes charts which illustrate the illness, hospital care, and mortality picture for each of the six ages.

Public Health

MONOGRAPH

No. 30

The accompanying summary covers the principal findings presented in Public Health Monograph No. 30, published concurrently with this issue of Public Health Reports. The authors are with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Collins, Selwyn D., Lehmann, Josephine L., and Trantham, Katharine S.: Major causes of illness and of death in six age periods. Public Health Monograph No. 30 (Public Health Service Publication No. 440). 22 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1955. Price 25 cents.

This report covering the continental United States is made jointly by the Tuberculosis Program, Division of Special Health Services, Public Health Service, and the National Tuberculosis Association.

Change in Tuberculosis Beds Occupied

—Spring 1954–Fall 1954—

By STANLEY GLASER, JOSEPHINE JOHNSTON, and DONALD A. TRAUGER

INFORMATION concerning the changes taking place in tuberculosis bed occupancy has been incomplete and has given rise to conflicting speculation. Because of this, the survey reported in this paper was undertaken to provide current trends in this important area of tuberculosis control. The results of this survey indicate that there has been an average decline of slightly more than 6.5 percent in the number of tuberculosis beds occupied in the continental United States in the 8-month period between April 1, 1954, and November 30, 1954.

For the last 50 years, emphasis has been largely placed upon providing more and more tuberculosis beds to accommodate the large number of patients who needed tuberculosis hospitalization. In the past, most States lacked enough beds for the care of the known tuberculosis patients. In many instances, the beds that were provided left much to be desired in terms of proximity to patients, adequacy of the physical plant in which they were located, and scope and quantity of services provided. In terms of numbers, however, the supply had begun to catch up to the demand in some places. Within the last year or so, a few States have been indicating that they have more than enough beds to take care of all of their tuberculosis patients and that beds were being closed, or were going unused in relatively large numbers. In an effort to determine the average degree of the downward trend and the variation from State to State, the Public Health Service and the National Tuberculosis Association have undertaken the study reported in this paper.

Mr. Glaser and Miss Johnston are statisticians with the Tuberculosis Program, Division of Special Health Services, Public Health Service. Their work in tuberculosis hospital statistics began in 1947 and 1951, respectively. Mr. Trauger is associate director, division of social research, National Tuberculosis Association.

Study Pattern

The Tuberculosis Program of the Public Health Service annually collects information about the number of tuberculosis patients hospitalized in the United States. This information is obtained directly from the hospitals which take tuberculosis patients for treatment or for temporary care. The information collected in connection with this inquiry for April

1, 1954, was used as the study baseline (*1*).

In the fall of 1954, the National Tuberculosis Association inquired (*2*) as to the number of tuberculosis beds occupied in each hospital with tuberculosis beds. These data do not give information about any single day, but refer only to the day on which the replies were prepared. However, most of the data show the situation in November 1954. For convenience in notation, the data for April 1, 1954, are designated as "spring 1954," and the data collected subsequently by the National Tuberculosis Association and by the Public Health Service (as specified below) are designated as data for "fall 1954." In general, the data cover an 8-month span and are treated in this paper as though they were based on observations 8 months apart.

The number of non-Federal hospitals reporting in each week interval is shown here (*2, 4–6*) :

Week	*Number of hospitals*
1954:	
Prior to November 14	7
November 14	223
November 21	108
November 28	25
December 5	8
December 12	5
December 19	38
December 26	29
1955:	
January 3	10
January 10	7
January 17	2
January 24	1
Total	463

The National Tuberculosis Association data include information on the number of tuberculosis beds occupied in 450 non-Federal institutions. To this number the Public Health Service staff has added occupancy data for 145 hospitals (mostly Federal hospitals) bringing the total number of institutions in this study to 595. (Data for the 145 additional institutions were obtained from State health department reports, sanatorium reports, and Federal agency reports.) This paper presents the information resulting from the analysis and comparison of the data collected in the fall of 1954 with the data collected in the spring of 1954. For convenience, the term "TB bed occupancy" as used in this paper means the "number of TB beds occupied," and does not denote "the percentage of TB bed capacity which is occupied."

Estimate of Average Decrease

In the 595 Federal and non-Federal hospitals for which we had information, the decrease in occupancy in the 8-month period is 6.7 percent (table 1). We have no doubt that the seasonal fluctuation in tuberculosis bed occupancy is responsible for some part of this decrease. However, because we have little information about the magnitude of the seasonal fluctuation, we cannot estimate with confidence the percent decrease on an annual basis.

Non-Federal Hospitals

Information obtained from the inquiry conducted by the Tuberculosis Program in the spring of 1954 indicated that on April 1, 1954, there were 75,951 patients occupying tuberculosis beds in 568 non-Federal institutions (*1, 3*). In the fall of 1954 data were available for 463 hospitals including 31 which had ceased to take tuberculosis patients sometime after April 1, 1954, and two new hospitals which were not in operation in the spring of 1954, but which had tuberculosis patients occupying beds in the fall of 1954. The number of tuberculosis beds occupied in the 463 hospitals declined by more than 7 percent in the 8-month period (table 1). These 463 hospitals represent about 82 percent of the non-Federal institutions which had 5 or more tuberculosis beds on April 1, 1954; 89 percent of the non-Federal tuberculosis beds which were occupied on that date were in these 463 hospitals (*1–3*).

Three hundred forty-seven of the 463 non-Federal hospitals are tuberculosis hospitals. In this group the decrease in beds occupied is 7 percent. The remaining 116 hospitals in the non-Federal group are chiefly general hospitals which have a specified number (5 or more) of tuberculosis beds. The number of tuberculosis beds occupied in these hospitals has declined by 9.5 percent (table 1).

A comparison of the number of tuberculosis beds occupied in non-Federal hospitals between the spring and fall of 1954 is shown by States in table 2. The analysis of data for the United

States in terms of the individual States as units has many disadvantages because of the lack of homogeneity within States and because of the lack of comparability between States. However, in spite of the fact that the State must be considered an arbitrary and—in some statistical senses—an unsatisfactory unit of comparison, it is a unit that is generally accepted and understood. It will serve here to illustrate the great differences geographically in the change in tuberculosis bed occupancy over the 8-month period under consideration. Observe, for instance, that while one State experienced a decrease of 24.6 percent in the number of non-Federal tuberculosis beds occupied, another State experienced an increase of 18.0 percent. For these two States, every hospital that reported in the fall also reported in the spring. If reporting had been as complete for all other States, the greatest percent increase might have been more than 18 percent and the greatest percent decrease more than 24.6 percent, but neither of the extremes could have been smaller. Nineteen States showed decreases of less than 5 percent; 9 showed decreases of between 5 and 10 percent, and 13 had decreases of 10 percent or more. Seven showed increases ranging from about 2 percent to 18 percent.

Pattern of Change

There is no apparent geographic pattern to the changes in absolute numbers or percentages.

Table 1. Change in number of tuberculosis beds occupied, by type and control of hospital, continental United States, spring 1954–fall 1954

Type and control	Number of hospitals [1]	Number of TB beds occupied		Increase or decrease in beds occupied spring 1954–fall 1954	
		Spring 1954	Fall 1954	Number	Percent
Total	595	86, 530	80, 751	−5, 779	−6. 7
Non-Federal hospitals	463	67, 405	62, 445	−4, 960	−7. 4
Tuberculosis hospitals	347	57, 816	[2] 53, 766	−4, 050	−7. 0
State	86	24, 211	23, 477	−734	−3. 0
Local government (city, county, district)	181	27, 417	24, 953	−2, 464	−9. 0
Other (private, eleemosynary, nonprofit)	80	6, 188	5, 336	−852	−13. 8
Other hospitals with assigned tuberculosis beds	116	9, 589	8, 679	−910	−9. 5
State	8	544	543	−1	−0. 2
Local government (city, county, district)	76	7, 881	7, 190	−691	−8. 8
Other (private, eleemosynary, nonprofit)	32	1, 164	946	−218	−18. 7
Federal hospitals	132	19, 125	18, 306	−819	−4. 3
Veterans Administration	[3] 108	15, 739	15, 334	−405	−2. 6
Tuberculosis hospitals	21	7, 787	7, 514	−273	−3. 5
Other hospitals	87	7, 952	7, 820	−132	−1. 7
Other Federal hospitals	24	3, 386	2, 972	−414	−12. 2

[1] Thirty-one of these hospitals had tuberculosis patients in the spring of 1954 but were closed to tuberculosis patients by the fall of 1954 and two new hospitals were not in operation in the spring of 1954 but had tuberculosis patients occupying beds in the fall of 1954. No hospitals are included which had less than 5 beds for the care of tuberculosis patients.

[2] Since this study relates to continental United States only, 150 Alaska native patients hospitalized under contract are not included. Fourteen of these are in local government hospitals; 136 in other private hospitals.

[3] In the spring of 1954 there were 95 hospitals with 5 or more tuberculosis beds; in the fall of 1954, there were 108. For comparative purposes the number of beds occupied has been enumerated on the basis of the reporting method in effect in the fall of 1954—by type of bed patient.

SOURCE: References 1–6.

Table 2. Change in number of tuberculosis beds occupied in non-Federal Hospitals, by State, continental United States, spring 1954–fall 1954

State	Number of hospitals [1]	Percent coverage [2]	Number of tuberculosis beds occupied		Increase or decrease in number of TB beds occupied, sprin 1954–fall 1954	
			Spring 1954	Fall 1954	Number	Percent
Total	463	87. 4	67, 405	62, 445	−4, 960	−7. 4
Alabama	6	78. 0	566	560	−6	−1. 1
Arizona	15	95. 8	430	412	−18	−4. 2
Arkansas	2	100. 0	1, 566	1, 512	−54	−3. 4
California	47	93. 5	6, 635	5, 967	−668	−10. 1
Colorado	13	86. 7	874	784	−90	−10. 3
Connecticut	9	100. 0	1, 374	1, 087	−287	−20. 9
Delaware	1	100. 0	171	165	−6	−3. 5
District of Columbia	4	100. 0	939	891	−48	−5. 1
Florida	6	100. 0	1, 814	1, 803	−11	−0. 6
Georgia	2	95. 1	1, 887	1, 744	−143	−7. 6
Idaho	1	100. 0	75	74	−1	−1. 3
Illinois	31	97. 1	3, 719	3, 582	−137	−3. 7
Indiana	8	69. 7	939	900	−39	−4. 2
Iowa	5	91. 9	570	491	−79	−13. 9
Kansas	3	100. 0	394	362	−32	−8. 1
Kentucky	9	65. 9	945	917	−28	−3. 0
Louisiana	6	55. 8	626	598	−28	−4. 5
Maine	4	100. 0	329	273	−56	−17. 0
Maryland	7	97. 3	1, 589	1, 622	+33	+2. 1
Massachusetts	22	91. 2	2, 369	2, 152	−217	−9. 2
Michigan	27	100. 0	4, 528	4, 342	−186	−4. 1
Minnesota	10	85. 8	1, 267	1, 054	−213	−16. 8
Mississippi	2	95. 5	466	459	−7	−1. 5
Missouri	5	90. 2	1, 453	1, 349	−104	−7. 2
Montana	1	100. 0	178	210	+32	+18. 0
Nebraska	2	100. 0	179	168	−11	−6. 1
Nevada	2	100. 0	27	22	−5	−18. 5
New Hampshire	2	100. 0	128	121	−7	−5. 5
New Jersey	14	81. 0	2, 139	2, 037	−102	−4. 8
New Mexico	2	13. 7	50	57	+7	+14. 0
New York	54	94. 8	10, 186	8, 885	−1, 301	−12. 8
North Carolina	18	85. 5	1, 820	1, 756	−64	−3. 5
North Dakota	1	100. 0	201	160	−41	−20. 4
Ohio	23	96. 0	3, 322	3, 140	−182	−5. 5
Oklahoma	3	58. 9	375	350	−25	−6. 7
Oregon	5	100. 0	504	525	+21	+4. 2
Pennsylvania	24	72. 5	4, 023	3, 904	−119	−3. 0
Rhode Island	2	100. 0	452	341	−111	−24. 6
South Carolina	5	87. 1	734	715	−19	−2. 6
South Dakota	1	100. 0	106	109	+3	+2. 8
Tennessee	9	79. 4	1, 323	1, 265	−58	−4. 4
Texas	12	42. 9	1, 362	1, 300	−62	−4. 6
Utah	1	100. 0	72	70	−2	−2. 8
Vermont	1	28. 9	35	37	+2	+5. 7
Virginia	5	83. 7	1, 191	1, 212	+21	+1. 8
Washington	10	100. 0	1, 320	[3] 1, 039	−281	−21. 3
West Virginia	3	73. 3	777	683	−94	−12. 1
Wisconsin	18	92. 0	1, 376	1, 239	−137	−10. 0
Wyoming [4]	0	0				

[1] Number of hospitals for which reports were available in the fall of 1954.

[2] The proportion of tuberculosis beds in the State in April 1954 for which reports were available in the fall of 1954, based upon the rated tuberculosis capacity of the respondent hospitals, not upon the number of beds occupied.

[3] Adjusted for Alaska natives occupying beds.

[4] No data reported.

SOURCE: References 1–6.

Table 3. Change in number of tuberculosis beds occupied in non-Federal hospitals, by size (TB rated capacity) and type of hospital, continental United States, spring 1954–fall 1954

Size [1] (TB rated capacity) and type of hospital	Number of hospitals [2]	Number of TB beds occupied		Increase or decrease in number of TB beds occupied spring 1954–fall 1954	
		Spring 1954	Fall 1954	Number	Percent
All sizes (total)	463	67,405	62,445	−4,960	−7.4
Tuberculosis	347	57,816	53,766	−4,050	−7.0
All other [3]	116	9,589	8,679	−910	−9.5
5–49 beds	122	2,733	2,140	−593	−21.7
Tuberculosis	62	1,577	1,191	−386	−24.5
All other [3]	60	1,156	949	−207	−17.9
50–99 beds	101	5,844	5,051	−793	−13.6
Tuberculosis	82	4,774	4,113	−661	−13.8
All other [3]	19	1,070	938	−132	−12.3
100–149 beds	76	6,997	6,365	−632	−9.0
Tuberculosis	62	5,706	5,169	−537	−9.4
All other [3]	14	1,291	1,196	−95	−7.4
150–249 beds	67	10,460	9,553	−907	−8.7
Tuberculosis	57	8,759	8,042	−717	−8.2
All other [3]	10	1,701	1,511	−190	−11.2
250–499 beds	66	19,468	18,410	−1,058	−5.4
Tuberculosis	55	16,311	15,426	−855	−5.4
All other [3]	11	3,157	2,984	−173	−5.5
500–2,999 beds	31	21,903	20,926	−977	−4.5
Tuberculosis	29	20,689	19,825	−864	−4.2
All other [3]	2	1,214	1,101	−113	−9.3

[1] Intervals in this column represent the official tuberculosis bed capacity for each of the hospitals included in that interval and are different from the corresponding column in table 6, in which the intervals show the decrease in the number of patients occupying tuberculosis beds between spring and fall of 1954.

[2] Number of hospitals for which reports were available in the fall of 1954.

[3] Chiefly general hospitals with facilities for tuberculosis patients.

SOURCE: References 1–6.

Furthermore, there is no relationship between the changes in tuberculosis beds occupied and the rate of newly reported tuberculosis cases or deaths, or in the changes in these rates. On the other hand, the States which show the largest decline in tuberculosis bed occupancy are the ones which, in general, have the greatest number of tuberculosis beds per newly reported active tuberculosis case. This relationship is apparent when the data for all States are considered. It is even more obvious when the observation is based only on those States from which information about 95 percent or more of their tuberculosis beds was available.

An analysis of official rated bed capacity indicates that the greatest average percentage decline in number of TB beds occupied has occurred in the smallest hospitals. Hospitals with less than 50 beds showed the largest decrease. The average decrease in beds occupied for this group is almost 22 percent. For hospitals with between 50 and 99 tuberculosis beds, the average decrease was close to 14 percent, and for hospitals with between 100 and 149 beds the average decrease was 9 percent. Table 3 shows that this relationship extends to the groups of still larger hospitals—the larger the hospital, the smaller the average percentage decline in number of beds occupied. This is apparent when all types of hospitals are grouped by size, as well as when the tuberculosis hospitals are considered separately by size.

Tables 1 and 4 show changes in bed occupancy by ownership of hospitals. The non-Federal

groups called "other" in these tables are, for convenience, called private in the text. They are all nongovernment hospitals. This classification, however, refers to the ownership of the hospitals and not to the source of funds for the care of the tuberculosis patients. The care of some patients in nongovernment hospitals is provided at public expense. Some of the changes in TB bed occupancy in private hospitals may be due to changes in the availability of public money for the care of patients in private hospitals.

When the ownership of the hospital is considered, it is evident, as shown in table 1, that the smallest average decline in the occupancy of tuberculosis beds occurred among the State-owned hospitals. The largest average decline in occupancy was among the private hospitals, with the local government hospitals falling in between. There is a pronounced relationship between the ownership of tuberculosis hospitals and their size. On the average, State tuberculosis hospitals are the largest, local government hospitals are intermediate in size, and private hospitals are the smallest (table 1).

There arises, therefore, the question of whether the relative changes in tuberculosis bed occupancy are associated with the hospitals be-

Table 4. Change in number of tuberculosis beds occupied in non-Federal hospitals by size (TB rated capacity) and type of hospital, continental United States, spring 1954–fall 1954

Size[1] (TB rated capacity) and control of hospital	Number of hospitals[2]	Number of TB beds occupied		Increase or decrease in number of TB beds occupied spring 1954–fall 1954	
		Spring 1954	Fall 1954	Number	Percent
All sizes (total)	463	67,405	62,445	−4,960	−7.4
State	94	24,755	24,020	−735	−3.0
Local government	257	35,298	32,143	−3,155	−8.9
Other non-Federal	112	7,352	6,282	−1,070	−14.6
5–49 beds	122	2,733	2,140	−593	−21.7
State	4	98	103	+5	+5.1
Local government	70	1,680	1,306	−374	−22.3
Other non-Federal	48	955	731	−224	−23.5
50–99 beds	101	5,844	5,051	−793	−13.6
State	7	468	459	−9	−1.9
Local government	62	3,560	3,161	−399	−11.2
Other non-Federal	32	1,816	1,431	−385	−21.2
100–149 beds	76	6,997	6,365	−632	−9.0
State	18	1,835	1,648	−187	−10.2
Local government	45	4,077	3,698	−379	−9.3
Other non-Federal	13	1,085	1,019	−66	−6.1
150–249 beds	67	10,460	9,553	−907	−8.7
State	17	2,478	2,490	+12	+0.5
Local government	35	5,684	5,180	−504	−8.9
Other non-Federal	15	2,298	1,883	−415	−18.1
250–499 beds	66	19,468	18,410	−1,058	−5.4
State	34	9,971	9,834	−137	−1.4
Local government	28	8,299	7,358	−941	−11.3
Other non-Federal	4	1,198	1,218	+20	+1.7
500–2,999 beds	31	21,903	20,926	−977	−4.5
State	14	9,905	9,486	−419	−4.2
Local government	17	11,998	11,440	−558	−4.7
Other non-Federal					

[1] Intervals in this column represent the official tuberculosis bed capacity for each of the hospitals included in that interval and are different from the corresponding column in table 6, in which the intervals show the decrease in the number of patients occupying tuberculosis beds between spring and fall of 1954.

[2] Number of hospitals for which reports were available in the fall of 1954.

SOURCE: References 1–6.

cause of their size or because of their ownership. Table 4, while it does not present an unequivocal picture, shows that size is probably a more important determinant of the change in tuberculosis bed occupancy than is ownership. For instance, among institutions with less than 50 beds there are relatively large numbers of institutions in the categories of local government hospitals and of private hospitals. For each of these categories, the percent decrease is substantially the same. In the group of hospitals with between 100 and 149 tuberculosis beds, the State hospitals have the largest percentage decrease and the private hospitals have the smallest percentage decrease. This group is composed of a fairly large number of hospitals and a fairly large number of beds in each category. Among the large hospitals that have from 250 to 499 tuberculosis beds, the local government hospitals have the largest percent decrease in tuberculosis bed occupancy while the State and private hospitals show very small changes. In the largest group of hospitals—those that have more than 500 tuberculosis beds—the State and local government hospitals have decreases of about the same magnitude. It is interesting to notice, by way of contrast, that while the local government and private hospitals show smaller decreases in tuberculosis bed occupancy as we go up the size scale, the State-owned hospitals do not show this trend.

Distribution of Closed Facilities

Thirty-one of the 463 non-Federal hospitals which took tuberculosis patients in the spring of 1954 were closed by the fall of 1954 or had closed their tuberculosis units. These 31 hospitals had a total of 2,362 tuberculosis beds (official rated capacity). In the same period it is known that 2 new tuberculosis hospitals opened with a capacity of 470 tuberculosis beds. This resulted in a net decrease of 1,892 in the number of tuberculosis beds in the continental United States as a result only of the closing of old hospitals and the opening of new hospitals. The corresponding net decrease in tuberculosis bed occupancy is 1,341.

The 31 closed institutions were all located in 10 States; 9 of the institutions were in 1 State which has a progressive program of new construction to replace small outmoded institutions (*1*, *2*, *4–6*).

Twenty-five of the closed institutions were tuberculosis hospitals, the majority of which were old and had a fairly small capacity for tuberculosis patients. Five of the 25 were from 51 to 86 years old; 8 were from 36 to 50 years; 10 were from 14 to 29 years; and only 2 were fairly new, 4 to 5 years old. Eleven of these tuberculosis facilities had less than 50 beds; 6 had from 50 to 74 beds; and the remaining 8 hospitals had 75 beds or more. Table 5 shows the distribution of closed hospitals by rated capacity for tuberculosis. (The size classification shown in tables 3, 4, and 5 is in terms of rated capacity for tuberculosis, as distinguished from the size classification given in table 6, which is in terms of the numerical change in the number of beds occupied.) Six of the 25 tuberculosis facilities were privately owned, 2 were State owned, and all others were owned by the local government—city, county, or district.

The remaining 6 hospitals in the non-Federal group were general hospitals which closed their tuberculosis wards. These facilities were mostly in old hospitals ranging from 35 to 61 years old, the only exception being a 14-year-old hospital. Three of the 6 hospitals had less than 25 tuberculosis beds; only 1 had more than 50 beds (table 5). All except one were owned by the local government; it was privately owned.

Twenty-four of the 31 closed institutions had less than 50 tuberculosis patients each on April 1, 1954. The other 7 institutions had 50 or more patients hospitalized on that date (table 6).

Federal Hospitals

In the 132 Federal hospitals for which data were available in the fall of 1954, there is a decrease in tuberculosis bed occupancy of 4.3 percent (table 1). One hundred and eight of the Federal hospitals (about 82 percent) are Veterans Administration hospitals in which there were 15,334 beds occupied by tuberculosis patients in the fall of 1954. This number represents 83.8 percent of the total number of tuberculosis beds occupied in the 132 Federal hospitals.

Data furnished by the Department of Medi-

Table 5. Distribution of closed non-Federal tuberculosis facilities, by size, spring 1954–fall 1954

Size of hospital (TB rated capacity) [1]	Total		Closed TB hospitals		Closed TB sections in general hospitals	
	Number of closed TB facilities	Number of TB beds occupied April 1, 1954	Number of institutions	Number of TB beds occupied on April 1, 1954	Number of institutions	Number of TB beds occupied on April 1, 1954
Total	31	1,581	25	1,481	6	100
5–24	6	62	3	31	3	31
25–49	10	218	8	185	2	33
50–74	7	275	6	239	1	36
75–99	1	40	1	40	0	0
100–149	3	135	3	135	0	0
150–249	2	250	2	250	0	0
250 and over	2	601	2	601	0	0

[1] Intervals in this column represent the official tuberculosis bed capacity for each of the hospitals included in that interval and are different from the corresponding column in table 6, in which the intervals show the decrease in the number of patients occupying tuberculosis beds between spring and fall, 1954.

SOURCE: References 1–6.

cine and Surgery of the Veterans Administration show that the number of tuberculosis beds occupied in the Veterans Administration hospitals has decreased by 2.6 percent in the 8-month period. This decrease appears to be small by comparison with the average decrease and by comparison with the decreases in some other classes of hospitals. This figure, however, reflects only the change in the number of persons hospitalized for tuberculosis in VA hospitals; it does not take account of those persons hospitalized under contract in other hospitals. The number of tuberculosis patients receiving care under VA auspices in contract hospitals has been decreasing since February 1947, and in the 8-month period between March 31 and November 30, 1954, decreased from 916 to 528. This policy of decreasing contract hospitalization and making maximum use of VA hospitals in the presence of a decreased demand for tuberculosis beds is responsible for part of the decrease in bed occupancy in other Federal hospitals and in non-Federal hospitals. Because of the effect of this policy, the average decrease of 6.7 percent for the whole United States has more meaning as a summary figure than the average decrease of 7.4 percent for non-Federal hospitals only. The total number of patients hospitalized by VA in both its own and in contract hospitals decreased by about 5 percent.

Also of importance in connection with the demand for tuberculosis beds is reliable data about waiting lists. Although such data cannot be assembled for the whole United States, it is available for VA beneficiaries. On March 31, 1954, there were 947 such veterans awaiting admission as compared with 456 veterans on November 30, 1954. Thus, the total number of tuberculous veterans hospitalized and awaiting admission to VA hospitals was 17,614 on March 31, 1954. By comparison there were 16,358 on November 30, 1954, or a decline of slightly more than 7 percent. Here, however, one must recognize that a substantial number of patients may have obtained hospitalization elsewhere before they were reached on waiting lists.

If the VA hospitals are eliminated from the Federal data, the decline in the occupancy of tuberculosis beds in the remaining 24 Federal hospitals is 12.2 percent (table 1).

The Meaning of the Data

The decrease in tuberculosis bed occupancy discussed in this paper is a phenomenon of rela-

tively recent times. Previously, the trend has been steadily upward. Construction of hospital facilities solely for tuberculosis patients started just before the turn of the century. By 1904 there were fewer than 10,000 tuberculosis beds in the United States. This number increased until on April 1, 1953, in the continental United States, there were almost 110,000 tuberculosis beds in which there were more than 96,000 patients. While the number of tuberculosis beds continued to increase, the number of tuberculosis patients hospitalized, however, has shown a decline since April 1, 1953.

During the first half of the century there was urgent need for more tuberculosis beds. As tuberculosis hospital facilities were increased, the number of tuberculosis patients hospitalized increased proportionately. During this period a continuous backlog of patients exerted pressure for the construction of more tuberculosis hospital facilities. However, even with this pressure, it was considered normal for 10 to 15 percent of the tuberculosis beds to remain unoccupied.

Table 6. Distribution of non-Federal hospitals by change in number of tuberculosis beds occupied, spring 1954–fall 1954

Change in TB beds occupied (number of beds) [1]	Number of hospitals reporting	Number of hospitals still open	Number of closed TB facilities	
			Tuberculosis hospitals	Tuberculosis sections in general hospitals
Total	463	432	25	6
No change	36	36	---	---
Increase	102	102	---	---
Decrease	325	294	25	6
1–9	156	154	1	1
10–19	68	61	3	4
20–29	30	26	4	0
30–39	28	20	7	1
40–49	16	13	3	0
50–99	18	15	3	0
100–199	7	5	2	0
200–299	1	---	1	0
300 and over	1	---	1	0

[1] Intervals in this column represent the decrease in the number of patients occupying tuberculosis beds between spring and fall, 1954, in each of the hospitals included in that interval and are different from the corresponding column in tables 3, 4, and 5, in which the intervals represent the size (TB rated capacity) of the hospitals.

SOURCE: References 1–6.

The decreases which are apparent may be assigned to three causes: reduced demand for tuberculosis hospital facilities, seasonal fluctuation in the data, and representativeness of the reporting hospitals.

While the data available for this paper are much more comprehensive than the occasional reports about bed occupancy which were available around mid-1954, even the data used here leave much to be desired. Although the response rate was remarkably high on the whole, many States are represented by only a small proportion of the total number of beds in the State (table 2). Confidence in the results of this study must be based upon the magnitude of the response rather than upon knowledge of its representativeness. Although the response rate is quite high, we do not know whether the respondents are representative of the whole United States. Nor do we know whether the respondents in a given State adequately represent that State unless every hospital with tuberculosis beds reported in the fall of 1954. The smaller the proportion of beds reported, the less our confidence in the representativeness of the available data.

Moreover, it is not safe to assume that there is a uniform surplus of beds in a State even when all hospitals report, and when the State shows a decrease in tuberculosis bed occupancy. Even this situation may mask serious bed shortages in some parts of the State, or for some classes of patients. For instance, Missouri shows a decrease of 7.2 percent in the number of non-Federal beds occupied over the 8-month period under consideration. However, there are no beds available in Kansas City for children under 12 years of age. Children who need treatment are given limited hospitalization at the Kansas City General Hospital isolation ward. If continued care is indicated, children under 12 must be sent out of the State to a private hospital. Moreover, in Missouri, in spite of the decrease in tuberculosis bed occupancy shown by this study, there were, in October, 41 patients awaiting admission to the State sanatorium at Mount Vernon. In Kansas, which showed a decrease in tuberculosis bed occupancy

of 8.1 percent, there is usually a 3- to 4-week waiting period for admission to State hospitals. In Kentucky, which showed a small decrease of 3 percent in tuberculosis bed occupancy, there is a waiting period of several weeks.

The decrease in tuberculosis bed occupancy for the State of Alabama is so small in the 8-month period that it may be entirely discounted on the grounds of its being due to nonrepresentativeness or to seasonal fluctuation. However, because there does appear to be a slight decrease (table 2), it is useful to notice that at the time the 1954 annual report for the Jefferson Tuberculosis Sanatorium in Alabama was written, there were more than 80 Negro patients awaiting admission to the institution (*7*). Mississippi also shows a very small decrease but according to the report of a Public Health Service staff member on April 18, 1955, there are 245 Negroes on the waiting list, and it is believed that this number is an underestimate of the actual number of patients waiting for beds since many applications have not been filed because of the already long waiting list.

The preceding paragraphs illustrate that a decrease in bed occupancy can occur in a given State even in the presence of a need for additional beds. It is apparent from the foregoing that these figures, at best, reflect only changes in demand. Since there is a considerable difference between demand and need, these data should not be used as a direct measure of the change in need for tuberculosis hospital beds. Moreover, more beds than are now occupied or needed would be required if tuberculosis case finding and followup were more aggressively implemented. In "Tuberculosis Case Finding in Iowa," (*8*) for instance, it is pointed out that three-fourths of all of the cases of tuberculosis diagnosed in Iowa during 1952 came to diagnosis "because of symptoms associated with tuberculosis." Many of these cases could have been found earlier by aggressive case finding.

A careful study in Polk County, Iowa, including the city of Des Moines, showed that about 60 percent of the 83 new tuberculosis cases discovered during 1952 and 1953 came to diagnosis because of symptoms. Moreover, for two-thirds of the cases, earlier occasions were identified when a diagnosis of tuberculosis might have been made. Forty percent of the missed opportunities were attributed to a break in the followup procedure. It is especially interesting to note that the "missed opportunities" were identified only among the moderately and far advanced cases; none could be found for the minimal cases (*9*).

Additional evidence that X-ray case finding has not yet reached the limit of its usefulness is found in the facts that:

A million and a half more case-finding films were taken in 1953 than in 1952 without a decrease in the yield of new cases resulting from the case-finding efforts (*10*). Moreover, 78 percent of the newly reported active and probably active cases for which the extent of disease was specified in 1953 were in the moderately or far advanced stage of disease at the time they were reported. There was essentially no change between 1952 and 1953 in the proportion of cases reported as minimal, moderately advanced, and far advanced (*11*).

About 5 percent of all newly reported tuberculosis cases were first made known to the health department only at the time of death (*11*).

Summary

1. The overall average decrease in the number of tuberculosis patients occupying beds in all types of hospitals, Federal and non-Federal, in the continental United States, was 6.7 percent in the 8-month period between April 1954 and November 1954.

2. States which show the largest decline in non-Federal tuberculosis bed occupancy are the ones which, in general, have the largest ratios of tuberculosis beds per annual newly reported active tuberculosis case.

3. The greatest percentage decrease in number of non-Federal tuberculosis beds occupied has occurred in the smaller hospitals; the larger the hospital the smaller the average percentage decrease in number of beds occupied.

4. There is wide variation in the changes in bed occupancy in non-Federal hospitals from State to State. More States show decreases than increases; however, not all of the States which show decreases have a surplus of beds.

5. The average decrease in number of tuberculosis patients occupying beds in all Federal hospitals is 4.3 percent. The Veterans Admin-

istration hospitals, accounting for about 82 percent of the beds in the Federal group, show an average decrease in tuberculosis bed occupancy of 2.6 percent. This average becomes about 5 percent when contract hospitals are combined with Veterans Administration hospitals. The average decrease in tuberculosis bed occupancy in the remaining Federal hospitals (Army, Navy, Air Force, Public Health Service, and the former Bureau of Indian Affairs) is 12.2 percent.

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Institutes in Care of Prematures

Three physician-nurse institutes in the care of premature infants have been scheduled during 1955–56 at the New York Hospital-Cornell Medical Center.

The institutes, now in their seventh year, are sponsored by the New York State Department of Health and the Children's Bureau of the Department of Health, Education, and Welfare. They are designed for physicians and nurses in charge of hospital premature nurseries and special premature centers and for medical and nursing directors and consultants of State and local premature programs.

The institutes, of 2 weeks' duration for physicians and 4 weeks for nurses, start September 26, 1955; November 21, 1955; and January 30, 1956. If the number of applicants is sufficient, additional institutes will be scheduled in 1956 beginning April 2 and May 21. Each institute is limited to six physician-nurse teams.

Participants pay no tuition fee, and stipends are provided to help cover expenses during attendance.

Early application is essential in planning the institutes. Additional information may be obtained by writing: Box 143, Institute in the Care of Premature Infants, New York Hospital, 525 East 68th Street, New York 21, N. Y.

The 1954 National Conference on Shellfish Sanitation

By E. T. JENSEN, B.S.C.E.

SANITARY control of growing, harvesting, and processing of shellfish in the United States is achieved by a unique cooperative program operated jointly by the Public Health Service, the States, and the shellfish industry.

This cooperative shellfish sanitation program had its start in the wake of a serious oyster-borne typhoid epidemic. Late in the winter of 1924, simultaneous outbreaks of typhoid fever were noted in Chicago, New York, Washington, and several other cities. In all, 1,500 cases of typhoid fever and 150 deaths in excess of the normal incidence for the disease were reported. A comprehensive epidemiological investigation implicated fresh oysters as the vehicle responsible for the outbreak (*1*).

The resulting adverse publicity caused sales of oysters and clams to drop virtually to zero in some areas, and the shellfish industry was soon in a state of economic collapse. To reestablish public confidence in raw, fresh shellfish as food, the industry and certain governmental agencies appealed to health authorities for assistance.

Accordingly, the Public Health Service called a public meeting in Washington, D. C., on February 19, 1925, to formulate a plan for sanitary control of the shellfish industry. The meeting was attended by many State health officers, city health officers, and representatives of other interested State and Federal agencies and of the shellfish industry.

The result was the development of a system of shellfish sanitation which placed responsibility for shellfish sanitation with the States and which is coordinated by the Shellfish Sanitation Section of the Public Health Service.

The Public Health Service was to develop standards, conduct research, review State programs, and advise receiving States of the effectiveness of shellfish sanitation programs in the producing States. This last responsibility has been fulfilled in recent years by distribution of a periodic compilation of State-certified shellfish shippers. The program is considered supplementary to the Food, Drug, and Cosmetic Act (*2*), and is universally supported as necessary because of the sanitation problems peculiar to shellfish growing and harvesting. In the program, shellfish is defined to mean only oysters, clams, and mussels. The shellfish certification system does not apply to crabs, lobsters, or shrimp.

The success of the shellfish sanitation control program is indicated by the absence of major outbreaks of shellfish-borne typhoid or enteric disease during the 30 years it has been in operation. Despite this long period of successful operation there has been need for a critical re-

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view of the shellfish certification system by participating organizations. This need resulted from technological advances in food-handling methods and from the realignment of State health department environmental sanitation activities.

To Review Certification Program

The Association of State and Territorial Health Officers, at its 1953 meeting, adopted a resolution calling on the Public Health Service to sponsor a conference for review of the shellfish certification program.

Acting on this request, the Surgeon General of the Public Health Service invited State and Federal agencies, the shellfish industry, and the Canadian Government, because of our interrelationship with Canada's shellfish certification program, to send representatives to the National Conference on Shellfish Sanitation, in Washington, D. C., September 9 and 10, 1954. The chief and deputy chief of the Bureau of State Services, Public Health Service, presided at the conference.

The conference was attended by 8 State health officers, 28 representatives from State agencies having interests in shellfish sanitation, and 20 from the shellfish industry. Four members of the Canadian Government were present. Our Government was represented by officials from the Department of State, the Department of Interior (the Fish and Wildlife Service), and the Department of Health, Education, and Welfare (the Food and Drug Administration and the Public Health Service). Only 3 interior States were represented; there were no representatives from the east coast clam industry.

To achieve an orderly discussion of all major topics, a 14-member representative committee had prepared an agenda, which included:

- Problems in sanitary control of shellfish production.
- Problems in sanitary control of shellfish marketing.
- Public Health Service participation in shellfish sanitation activities.
- Different sanitary regulations for intrastate and interstate shellfish shippers.
- Importation of shellfish.
- Classification of growing areas.
- Need for specific sanitary requirements for various species of shellfish.
- Future operations of shellfish control programs.

Discussion of these topics led to several general conclusions, most important of which was the indication of satisfaction with the cooperative control program which was expressed by all present at the conference. It was apparent that everyone concerned with shellfish sanitation was convinced that the certification system had been most effective in controlling the spread of shellfish-borne disease and that the system should be continued.

The problem of maintaining interior State interest in shellfish certification was discussed at length, but no conclusion was reached regarding a method of obtaining such interest. The question of breaded-shellfish certification was similarly discussed, but no positive conclusion was reached. However, it was apparent that there was a division of opinion on need for certification of prepared shellfish products. Several State representatives stated there was insufficient public health justification for extending certification to the breaded product.

While it was decided that problems related to shellfish importation (*3*) should be further discussed among the interested Federal agencies, the State representatives were unanimous in their opinion that shellfish imported into this country should meet the same sanitary standards as required for domestically produced shellfish.

The Future of the Program

The following resolution, unanimously adopted, expresses the sense of the conference:

Whereas, to safeguard public health, there is a continuing need for a program for sanitary control of shellfish processing and distribution in receiving areas, and

Whereas, the establishment of adequate control measures in both producing areas and receiving areas will assist the shellfish industry and provide protection for the ultimate consumer, therefore, be it resolved:

1. That the present policy of Federal-State and industry cooperative relationship be continued, including the listing of certified shell-

fish dealers by the United States Public Health Service, based on its endorsement of the various States' programs.

2. That the Public Health Service develop specific minimum requirements for endorsing States' shellfish programs, which shall take into account varying geographic and other conditions and the various species of shellfish grown therein.

3. That the certification of shellfish packers and repackers, with endorsement of satisfactory State programs by the United States Public Health Service, be developed in all receiving States.

4. That all States be encouraged to require that only shellfish from certified dealers be permitted to be sold.

5. That the program for sanitary control of the shellfish industry be maintained throughout the year in both producing and receiving States.

6. That the Public Health Service maintain a staff to carry out its responsibility in this program, including the necessary research and consultation service.

Action to implement the several sections of the resolution will be initiated by the Public Health Service. However, the ultimate measure of value of the shellfish certification program will be determined by the States' action in refusing to accept shellfish having a questionable certification status.

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Syphilis Serology Courses

Nine laboratory refresher courses will be offered at the Venereal Disease Research Laboratory of the Public Health Service in Chamblee, Ga., September 1955–May 1956.

Six of the courses cover the serology of syphilis in general. They include lecture, demonstration, and participation classes in the most widely used American methods for the serodiagnosis of syphilis, including the latest developments. They are to be held on the following dates:

September 26–October 7, 1955	February 6–17, 1956
October 24–November 4, 1955	March 12–23, 1956
January 9–20, 1956	April 2–13, 1956

Tests for syphilis using *Treponema pallidum* as an antigen source are the subjects of two courses offered October 31–November 10, 1955, and April 16–27, 1956. There will be some class participation in the complement fixation, agglutination, and other such tests.

A course in the management and control of syphilis serology by the regional laboratory, designed for assistant laboratory directors and senior laboratory staff members, is scheduled for April 30–May 11, 1956.

Applications for any of these must be signed by a State health officer or laboratory director, or by a medical officer in charge in the Public Health Service. Application forms may be obtained by writing to: Director, Venereal Disease Research Laboratory, Division of Special Health Services, Public Health Service, Department of Health, Education, and Welfare, P. O. Box 185, Chamblee, Ga.

Air pollution, chronic illnesses, radiological health, dental health, and accident prevention call for fresh activity in a State occupational health program.

Potential of an Occupational Health Program in a State Department of Health

By DANIEL BERGSMA, M.D., M.P.H.

FIFTEEN YEARS AGO, when a program of industrial hygiene was started in the New Jersey State Department of Health as a Public Health Service demonstration, we learned the credo of preplacement physical examination, engineering control, and industrial hygiene toxicology. These items form the foundation stone of occupational health activities today, but they are only the foundation stone. Upon them can be built a superstructure that reaches into many areas of public health and community life.

Informing Community Groups

One of the great untapped potentials in occupational health is the informing of community groups who have an interest and responsibility in the health and welfare of the working population. Henry Doyle, chief of the Public Health Service's Occupational Health Program, has stated the unfortunate truth and the remedy: "It is generally recognized that the public . . . knows relatively little about what the government is doing to protect the health of the worker. In creating a climate of favorable opinion and action, publicity can serve as an invaluable tool."

Office memorandums, reports of field trips, letters to plant owners or plant managers are all an integral part of an official occupational health program, but these writings should not be the ultimate repository of all the staff's knowledge; neither should the technical paper nor the technical conference. It is the duty of every person engaged in an official health activity to translate his information, his special skills, and his achievements into terms that the community can understand. Then, administrative channels of communication must be established and so managed that the information reaches the public and the public is motivated to make use of it. Time consuming though it may be, the personnel of an occupational health unit must be ready and willing to teach at colleges or universities, to participate in industrial work shops, and to speak at association meetings and community forums.

As an example of such an activity, staff members of the New Jersey State Department of Health will soon present a lecture-demonstration at the annual meeting of the New Jersey State Bar Association. The presentation,

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Dr. Bergsma, who joined the New Jersey State Department of Health in 1938, has been commissioner of health of New Jersey since the creation of that title in June 1948. *This paper was presented before the 1955 Industrial Health Conference at Buffalo, N. Y., on April 26.*

which is entitled "Methods of Prophylaxis and Diagnosis of Occupational Diseases," has been meticulously worked out to demonstrate the physician-engineer-chemist t e a m w o r k approach. Thus, while admitting that much still remains to be done in public health medicine, we are preparing to invade one fringe of the law relating to public health.

Coordination With Other Programs

Recognizing that the worker has a place of residence as well as a place of work and that he is usually part of a family group, New Jersey's program of industrial hygiene was expanded to the program of adult and industrial health more than 7 years ago. The current name is adult and occupational health, which expresses the present-day philosophy of man as a total integrated human being.

With this view of man, it seems to me that plans for an occupational health program should be based upon coordinated public health practices. I believe that almost every activity in public health or preventive medicine could be improved by coordinating it and occupational health. In some instances, the occupational health program should take the initiative in organizing such joint effort.

Air pollution control, which is creating a pressing problem for most health departments, is one activity that might well be coordinated with occupational health. Rightly or wrongly, industrial installations are often accused of being the perpetrators of the crime of air pollution. In any event, an investigator who knows what is going on inside an industrial plant is in a particularly advantageous position to know what is coming out of it. Since this knowledge is in the hands of the occupational health unit, this unit is one logical place for a health department to organize an air pollution control program.

But, of course, industrial air effluent is not the only cause of air pollution. Pollens, for example, are often a significant part of the total picture. Therefore, if the occupational health unit is responsible for air pollution control, it will need to coordinate its work with that of the unit in charge of pollen sampling and eradication of ragweed.

A recent study in New Jersey of house paint discoloration allegedly caused by a nearby rubber industry revealed that the agent of the discoloration was mildew. We have no bureau of fungus control in the New Jersey health department, but I am happy to delegate this function to the adult and occupational health program.

With the exception of berylliosis, specific disease syndromes from air contaminants are difficult to establish. It has been said that an epidemiological study extending over 20 to 30 years is necessary for a determination of the long-term effects of air contaminants. Such a study must obviously be a coordinated project of the programs for occupational health, chronic illness control, and vital statistics. In the study, morbidity and mortality records, multiphasic screening to detect chronic diseases, and air sampling would be of equal importance.

Having once joined forces with the chronic illness control program, the vital statistics unit, and other health department activities, the occupational health program should be ready and willing to cooperate with them in the use of every available resource to restore and enhance the health of the community. The newer multiphasic screening techniques furnish an excellent means by which the occupational health program may assist in the development of a positive adult health program. Through education and demonstration efforts designed to initiate preplacement and periodic physical examinations in industry, it can be emphasized that industrial medical services are preventive not only for occupational diseases but for the far more numerous nonoccupational illnesses that afflict industrial workers.

Tuberculosis, diabetes, heart disease, cancer, and venereal disease are among the disorders that can be revealed by relatively simple methods. Every industrial plant should be encouraged to expand the spectrum of its preplacement and periodic physical examinations so that symptoms of these diseases may be detected. Proper facilities may be available at the plant, mobile units may be used for demonstrations, or employees may go to community health centers.

Mass serologic testing programs to uncover venereal disease can easily be performed in in-

dustrial plants either by community public health personnel or by plant medical personnel. Such programs can be stimulated by the staff of the adult and occupational health program, and proper followup and treatment of any cases detected, as well as the tracing of sources and contacts, can be assured through coordinated effort.

Following the development of cancer detection services, industrial plant management should be encouraged to have employees participate, especially those employees 45 years of age and over. In industrial areas where cancer mortality or cancer morbidity of a specific type increases suspiciously, personnel of the adult and occupational health program should be requested to visit the plant and to conduct studies to determine the presence of known or suspected carcinogenic agents. In the present state of our knowledge, the environmental and occupational carcinogens compose the only phase of cancer control in which true prevention can be a fact.

Radiological Health

Any current discussion of cancer control as a public health activity leads one to problems of radiological health. Radiation is an excellent example of a two-edged sword. It can be used to detect and treat new cancer growths, but, also, it has definitely been incriminated as a prime agent in the causation of cancer of the skin, the bones, the lungs, and the blood. The increasing use of radioisotopes and all other sources of ionizing radiation has created the need for organized public health programs in radiological health. Personnel willing to be trained, and capable of being trained, in the new science of nuclear physics are found in occupational health units.

Industrial X-ray machines, industrial radiography using radium or cobalt-60, static eliminators, beta gauges, and tracer uses of a variety of radioisotopes have been the initial stimulus for expanding industrial hygiene techniques into the field of radiation. However, the public health problem is larger and more complicated than industrial utilization of ionizing radiation. X-ray machines for diagnosis and therapy, radioisotopes for research and for treatment, detection, and localization of pathology, fluoroscopic shoe-fitting machines—all these increase the radiation exposure of the general public and make necessary education in the safe handling of these items and varying degrees of regulation and control.

It has become one of the functions of New Jersey's adult and occupational health program to administer all phases of radiological health. The most effective way to reach professional groups has proved to be through the health department's medical programs. Monitoring of mobile chest X-ray units and of tuberculosis clinics, heart disease clinics, and multiphasic screening installations has impressed physicians, nurses, technicians, and local health department staffs with the basic principles of good radiological methods. It is, of course, not adequate for the occupational health representative to perform the required instrumentation, make a report, and then depart. Unless he learns something about the incidence and prevalence of disease in the community and obtains a working knowledge of what the radiation procedure is expected to accomplish, he cannot draw valid conclusions concerning the justification for a single radiation exposure as extensive as that used in angiocardiography or for the repeated exposures used in suspected or arrested cases of tuberculosis, for example.

Approaching the Second Milestone

What I have discussed so far is about the extent of the progress made by our occupational health staff. We have not limited ourselves to strict routine; on the other hand, we have not utilized all the tools available to a State health department.

The New Jersey State Department of Health is well past the first of the two industrial hygiene milestones cited by Victoria Trasko (*1*)—the acceptance of industrial hygiene as a public health responsibility. The second milestone, the broadening of the concept of occupational health to embrace the total health of the worker, is just within sight on the horizon. To some degree, we are plagued by the usual shortages of personnel, equipment, and operating funds. Nonetheless, by maximizing cooperation with other health department programs, I am sure that the occupational health program could do

a better job without undue strain on present personnel.

One of the possibilities for further expansion is the coordination of occupational health and the dental health program. It is well known that a healthy oral cavity has a direct constructive influence on industrial production and, conversely, that an oral infection has an adverse influence. "An aching tooth in an individual can become a company's toothache affecting not only the well-being of the individual but jeopardizing the safety of fellow employees. Pain of dental origin causes loss of sleep, fatigue, and mental distraction. Accidents follow . . ." (*2*).

I can visualize a two-way process in which the public health dentist makes a contribution to occupational health and the occupational health staff expedites basic dental health activities. The services of the public health dentist may be enlisted to provide educational material for industrial employees as to the value of routine periodic dental examination. By virtue of his contact with State and county dental societies, he is also in a position to supply information concerning community dental resources. He may even contribute more directly by becoming the consultant on oral pathology due to specific occupational materials. In turn, the occupational health staff can assist in the encouragement of fluoridation by demonstrating that fluorides have been handled in industry for many years without the occurrence of toxic effects when adequate precautions are taken. This information properly and personally supplied by an occupational health physician or an industrial engineer or toxicologist would carry considerable weight in quieting the fears of those who suspect that fluoride in water constitutes a latent hazard.

Impaired hearing is another area in which the occupational health program may work constructively with other groups. Occupational hearing loss is one of the newer and more popular concerns of the industrial hygienist. Impaired hearing and speech defects in children receive attention in maternal and child health programs and in programs for handicapped children. Pooling the efforts of these programs should afford a considerable increase in the knowledge of hearing changes that occur with advancing age. It should also suggest to the busy industrial hygienist that rehabilitation of persons suffering hearing loss is often possible for adults as well as for children.

Additional areas for investigation become apparent as occupational health is coordinated with the maternal and child health program. One of these concerns the common household substances which have proved dangerous, and even lethal, to children and the unwary housewife. The industrial toxicologist member of the occupational health team is preeminently qualified to discuss the hazardous components of cleaning fluids, bleaches, insecticides, and other substances and, with the industrial physician, to prepare a schedule of emergency treatments. The maternal and child health personnel, through their contacts with parent-teacher associations, women's clubs, and child care clinics, are in a position to spread the word.

A second joint project for occupational health and maternal and child health, one which I have not seen described elsewhere, concerns the probable special susceptibility of the pregnant woman to toxic materials, such as the chlorinated hydrocarbons, benzol, and radiation. The health department frequently receives requests from industrial plants and labor unions for information concerning the employment of pregnant women. The occupational health staff should have more to offer than the ordinary rules about rest periods and sedentary occupations.

Accidents and accident prevention have only recently begun to attract the attention of health departments. The accident-prone individual in industry has been described as careless, tired, nervous, worried, or in conflict with society. The problem of accidents in industry can be handled to some extent by health counseling, but actually it is part of the larger problem of community mental health.

Community agencies offer valuable resources for assistance with personal problems or health counseling. The occupational health staff might well investigate the community facilities that can assist the disgruntled, accident-prone individual or the individual who seeks escape by way of alcohol. Familiarity with the tenets of mental health will help in solving the problem of the tired, listless worker, whose emotional difficulties often arise from an unsatis-

factory environment. An employee's loss of satisfaction with his job added to his distrust of the society in which he lives and works may well result in fatigue, indifference, or illness. This concept of the emotionally disturbed worker underlies what has been called by some industrial hygienists human engineering. I think what is needed is the promotion of mental health, and I believe that mental health should be the responsibility of community organizations.

Strengthening Local Health Departments

Assistance in dealing with the problem of accidents is not the only way in which the community can contribute to occupational health. In fact, it is not expected that a State health department staff will be large enough to provide direct services on the community or local level. Perhaps the outstanding responsibility of a State health department is to strengthen local health departments and to provide them with consultation and ancillary services sufficient for them to administer direct services in their own jurisdiction.

The Committee on Scope of the American Public Health Association's Occupational Health Section has taken this stand on occupational health activities by local health departments (according to the committee's report at the 1954 meeting of the association): "The committee feels that there is an untapped reservoir of opportunities in occupational health at the local health department level. Not only in the development of pure industrial health activities by local health departments, but the use of occupational groups as a medium for the application of traditional health department functions needs to be exploited. For example, how many communities are there where industrial opportunities for the application of immunization programs, of adult health programs, of communicable disease control activities, etc., have been fully or even initially developed?"

When local health departments can be persuaded to attempt even minimal occupational health activities and to include industrial establishments and workers in their general health programs, a beginning will have been made toward solving the problem of medical services for small industrial plants. Strong community organization may well supply the impetus for better health care for all members of the community. The State occupational health personnel must be ready to provide information, demonstrations, and technical assistance.

The Fullest Potential

The aforementioned activities are only a few of the projects that may be classified as potentials for an occupational health program in a State health department. New Jersey is a small State, densely populated and highly industrialized, with a great diversity of industries. It could well serve as a clinic for studying preventive medicine and the adaptation of the adult to the complexities of today's social order.

This fall, Seton Hall University will open the doors of its new school of medicine, the first medical school in the State. I am hopeful that before long the curriculum will include courses in industrial medicine and occupational health. No physician practicing in New Jersey can fail to have among his patients many whose lives have been influenced by industrial processes.

I was much impressed by Dr. Jean Spencer Felton's address, "Increasing the Awareness of Occupational Medicine in a Medical Center" (*3*). Every topic that Dr. Felton discusses—industrial health lectures, plant tours, multiphasic screening, rehabilitation, job placement of the handicapped, and, last but not least, community orientation—could well be adopted by a State health department. Not until an occupational health program, either alone or in conjunction with a medical school or university hospital program, has assimilated and coordinated all these functions will it have reached its fullest potential.

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Approaches to the Quality of Hospital Care

By MINDEL C. SHEPS, M.D., M.P.H.

INCREASING ATTENTION is being paid to the problems of improving and of appraising the quality of health services in general (*1–8*) and of hospital care in particular. The general problems of measurement and evaluation in all these areas are similar (*9–16*). Basically, they involve finding valid and reliable measurements of quality and interpreting these measurements when made.

Purposes of Hospital Evaluations

Evaluations of hospital quality may have different purposes. The methods and standards selected must be related to the particular purposes for which they are being applied. The most familiar purpose is regulatory. Such an appraisal is designed to match an institution against specified standards that determine its acceptability for the purposes of the regulatory or accrediting agency. It is intended to correct abuses and raise the general level to an acceptable minimum. Various national bodies, now united in the Joint Commission for the Accreditation of Hospitals, have evolved minimum acceptable levels of facilities, equipment, administrative and professional organization, and professional qualifications. They have also made use of some numerical indexes of organization and performance. All of these have been set forth in the commission's Standards for Hospital Accreditation.

The requirements of licensing boards, health insurance funds, and other organizations serve a similar purpose. Regulatory appraisals set minimum or desirable levels by excluding institutions that fail to qualify. At the same time, this provides protection for patients and students who go to acceptable institutions (*17–20*). As yardsticks, these standards have one division that divides hospitals into two classes only—good enough or not good enough.

Improvement of Quality

The second purpose of appraisals is a closely related one—that of serving as a stimulus for the improvement of quality. Licensing and accrediting assessments serve this purpose as well as that of regulation. Hospitals also make self-appraisals for this purpose. The standards used may be minimum or optimum levels, similar to those used for regulatory purposes, or may provide for comparisons among physicians in the same institution. One of the chief instruments for such appraisals has been the medical audit (*21–25*).

The basis of the audit is a review of hospital records according to such criteria as qualitative judgments of the care given and examination of diagnostic errors (*26–29*), as well as such numerical indexes as mortality rates, rates for the

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incidence of specific complications, removal of normal tissues at operations (*30–32*), consultations, cesarean rates, and the rates for certain tests by diagnostic category. The term "professional service accounting" has been suggested for the compilation of these rates and "medical audit" for their evaluation.

Program Evaluation

The third, and more recently recognized, purpose for quality appraisal, is to study the effects of specific programs or procedures on the quality of care. Generally we may refer to this purpose as program evaluation. Certain procedures, such as clinical-pathological conferences, are believed to improve the quality of hospitals. Large-scale complex programs, such as regionalization, are under trial. It is essential that their effectiveness be examined. We need to know in detail the effect of such procedures on the care received by patients. Program evaluation is the attempt to study this effect, by seeing whether a difference or an improvement in quality is associated with a certain procedure or program.

In other situations the purpose of a program evaluation may be to see whether a certain institution is giving "good" care. Such an appraisal is basically an evaluation in which the judge compares what he finds with what in his mind seems desirable and possible.

For regulatory purposes, it is desirable to establish criteria which actually do differentiate between acceptable and unacceptable institutions. They must be discriminating at the level where the regulating agency feels the line must be drawn. To help in improving the quality of hospital care, the criteria used must discover the most important problems and reflect progress in meeting them. Criteria used for these purposes may be useful in program evaluation, but more refined measuring tools are also needed. A scale which only says "good enough" or "not good enough" is inadequate. What is needed is a scale that measures values along a continuum extending from one extreme to the other. The measurements used must be sensitive to those aspects of hospital quality that may be affected by the program.

Reference has been made to some of the standard methods in use. It has recently been stated that the statistics used in judging hospitals are "usually meaningless, often illogical and frequently unscientific" (*33*). For example, postoperative mortality ratios are based on deaths within 10 days divided by the total number of operations performed. Thus, deaths after 10 days are omitted, and on the other hand procedures of varying risks, such as dental extractions and neurosurgery, are indiscriminately lumped together.

Moreover, there is a question regarding the validity of the standards by which some of the indexes are evaluated (*33–36*). A top limit of 3 to 4 percent is set for cesarean sections, but current clinical practice and results justify consideration of a higher level. Many of the standards were derived empirically, and their validity was not adequately established. Progress in clinical practice, in any case, calls for frequent revision and revalidation of the standards. The standards to be used, therefore, should be at levels which move according to changing medical knowledge.

The American College of Surgeons and the Professional Activity Study Group in Michigan are cooperating on a new approach to the audit as a measuring device and on the development of new indexes (*36*). A number of new indexes of hospital or medical care have recently been described (*37–39*). Studies currently in progress in the Rochester Regional Hospital Council, the North Carolina General Practice Study, and the Boston Evaluation Study may produce other indexes.

Other methodological developments of interest have been the application of the time study technique to hospital nursing (*40*) and a statistical analysis of the items included in hospital licensing regulations (*41*).

Problems of Measurement

Hospital care is multidimensional. It is a service provided by a coordinated group of professional, technical, and other workers under the direction of a physician. The quality of the care received by patients is affected by the adequacy of the hospital facilities and their maintenance, by the administrative and professional organization of the hospital, by the competence of the personnel, and by the inter-

personal relations among the staff as well as between the staff and the patients.

Any consideration of evaluation, therefore, must recognize the large number of factors involved in patient care. It has been frequently suggested that an appraisal form for hospital quality be developed. Some have extended this concept to include deriving a final score or number to represent the quality of a given hospital. Such a composite index would obscure important differences. Moreover, it would be impossible to choose the items to be included and the relative weights for them on a basis that was generally applicable. On the other hand, a number of measurements can be made and each of these allowed to stand by itself, thus producing a profile of the hospital (*42*). We do not try to represent the health status of an individual by a single figure such as 90 percent of the optimum, but rather, we say something like:

"This patient's health, in general, is excellent, except for mild obesity and a hemoglobin of 10 grams."

Similarly, would it not be meaningful and helpful for the final report of a study to state not that "the quality is good" but rather something of this sort:

"Differences found in the following indexes were highly significant . . . No differences were observed in . . . The quality of physicians' services was significantly higher . . . The differences in social service were not significant . . ."

An exhaustive discussion of all the aspects of hospital care that could be included in such a profile will not be attempted. Instead it is proposed to deal with some of the methodological problems involved.

The main techniques used in appraisals of hospital quality can be divided into:

- The examination of prerequisites or desiderata for adequate care.
- Indexes of elements of performance.
- Indexes of the effects of care.
- Qualitative clinical evaluations.

By Set Standards of Care

According to the first approach, it is assumed that it is possible to select prerequisites for adequate care and that improvement of these factors leads to improved care. These prerequisites are minimum or optimum levels of facilities, equipment, professional training, and organization. As examples we may mention:

- The provision and appropriate maintenance of adequate physical facilities.
- The existence of special facilities, such as blood bank, bone bank, special laboratory and diagnostic facilities, premature nursery, and artificial kidney.
- An effective organizational structure, both administrative and professional.
- Standards and functioning of service departments such as records, laboratories, and libraries.
- Numbers of personnel by size of hospital—interns, residents, nurses, social workers, physical therapists, nutritionists, technicians.
- The availability of specialized personnel for consultation and of facilities for consultation with others, as in certain regional programs.
- Arrangements for ward rounds, refresher courses, continuing education.
- Minimum qualifications of personnel.
- The existence and functioning of internal controls, such as tissue committee, obstetrical committee, and medical audit.

The use of this approach implies the hypothesis that, given certain facilities and standards, the desirable quality of care is achieved. This hypothesis should be recognized and tested explicitly so that valid criteria can be used in a more informed fashion and to better purpose.

Consideration of the norms used for these desiderata raises such questions as, should they be national averages, regional averages, minimum adequate levels or optimum levels, or, should the search for standards be abandoned and the findings on various hospitals simply compared with each other? The answer depends partly on the purpose of the appraisal. In program evaluation, for example, it may be preferable to use flexible indexes applicable to different types of hospitals and to different periods, rather than to adopt any fixed standard of desirability.

Similar considerations led Stouman and Falk (*10*), in their proposals for international health indexes, to abandon the search for standards. If one has valid measurements for a characteristic, then intelligent, directed appli-

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cation of these measurements in some situations will provide useful information as to their variability and their significance without a norm.

The argument will perhaps be made clearer by an example. When we use an index such as weight of children, we need a knowledge of norms to assist in diagnosis of a particular child. However, if we want to test the effect of a certain vitamin on weight, we need to compare the gains made by children receiving the vitamin and those not receiving it. Knowledge of the norms is here irrelevant.

By Elements of Performance

The second approach to quality uses indexes intended to reflect one or more elements of performance. Indexes may be defined as "one or a set of measures . . . used to measure indirectly the incidence of a characteristic that is not directly measurable" (*43*). Patient care is such a characteristic. Its quality cannot be measured quantitatively, except by the arbitrary allotment of a certain number of points to a qualitative judgment. It is difficult to define; it is complex and intangible. It is therefore natural and logical that much of the effort to evaluate this quality has been focused on the development of indexes, for example:

- Utilization rates for specific procedures by category, such as admission chest X-rays as an index of preventive services, or rectal examination in specified groups of patients.
- Utilization rates of certain laboratory and other diagnostic procedures, by category.
- Indexes which would reflect the promptness and discrimination with which new procedures or drugs are used in the hospital.
- Referral rates and patterns.
- Autopsy rates.
- Cesarean rates.
- Pathological reports on surgical specimens.
- Correlations between preoperative and postoperative diagnoses and between ante-mortem and post-mortem diagnoses.
- Accuracy of diagnostic procedures.
- Average length of hospital stay by diagnosis. It may be hypothesized that in a well-organized service where the staff members work with purpose and integration, hospital stay will be shorter, on the average, for certain types of cases.
- Listing specific diagnostic and therapeutic procedures expected for each type of case and matching records against them.

Good indexes are objective, reliable, and valid. By the reliability or precision of a measurement, we mean the degree of agreement among repeated measurements of the same things. Numerical indexes, such as rates or ratios, would appear to be relatively precise—anyone counting the number of autopsies done out of all hospital deaths should get the same rate provided that a hospital death is defined without ambiguity. Reliability is more difficult to achieve in indexes that require measurement rather than counting, as has been shown when different physicians measure the same enlarged livers (*44*), or the same reactions to tuberculin tests (*45*). Agreement on interpretation of X-ray films, even when repeated by the same physician, is far from perfect (*46*). Quality indexes that depend on such assessments or on diagnosis, however made, must be tested for precision. It is an error to assume that because they are numerical they are precise.

The use of these performance indexes depends on an assumption that they are valid for an assessment of hospital quality. Presumably this involves the hypotheses (*a*) that each index does measure an element of patient care, and (*b*) that one or a number of these indexes are highly correlated with the intangibles of care. These hypotheses can and should be examined in the light of clinical information and by statistical analysis.

Again, the desirability and validity of the yardstick for these indexes must be examined. We can all agree that the higher the proportion of correct diagnoses, the better the quality of medicine. But what proportion ought we to expect in 1955 in different hospitals?

Other standards are even less definite. There can be too many laboratory tests as well as too few; too few cesareans as well as too many. Discriminating standards would be based on studies of the relation between good patient care and the resultant number of procedures by category of case. The development of appropriate yardsticks thus involves studies to estimate desirable levels for the various indexes and the expected variation. These levels should be adaptable for different types of hospitals

and capable of reflecting progress in clinical medicine.

By the Effects of Care

A third approach to appraising hospital quality is the use of indexes intended to measure the effects of quality of care on patient health. The outcome of specific therapy is influenced by many factors in addition to that of treatment, factors such as age, sex, nutrition, stage of the disease, and the emotional state of the patient. The use of these indexes may therefore be highly misleading. It necessitates a careful evaluation of concomitant factors and an attempt to control them.

Some instances of such indexes are in fairly common use. They include:

- Specific mortality ratios such as postoperative, puerperal, and neonatal.
- Survival rates of premature infants in a specified weight range.
- The incidence of preventable complications such as postoperative infections.

These indexes would seem to be relatively precise if their basis is carefully defined. A postoperative mortality rate depends only on the careful definition of postoperative deaths and of the types of surgery counted. However, the validity of this rate as an index of the quality of surgery would still need to be established. The definitions used are highly relevant to this validity. But even then questions remain:

Does the death rate within 10 days after major chest surgery really reflect the quality of care?

What about the effect of such patient characteristics as diagnosis, complicating illnesses, age, sex, and nutritional status?

Objective indexes of the kinds discussed therefore require careful definition and evaluation. They hold considerable promise for the appraisal of hospital quality, but they are not yet the ideal measuring tools. At best, they are indirect and partial indicators of the basically intangible characteristic with which we are concerned. In a given organizational setting, with access to given standards of consultation and services, doing a certain number of laboratory examinations, one can have numerous shades in the range of quality of care, depending on the skill, the judgment, the experience and the character of the persons involved and on their relationships with patients. This end product is what one really is trying to evaluate in any assessment of patient care. It is for this reason that some workers have tackled the problem of evaluating quality directly through the fourth approach, namely a clinical evaluation.

By Clinical Evaluations

Makover (*47*) included a clinical evaluation in his study of medical groups associated with the Health Insurance Plan of New York. The continuing HIP evaluation program has adapted some of his techniques as well as adding new ones. According to a preliminary unpublished report by M. A. Morehead, delivered at the 1954 New England regional meeting of the American Public Health Association, records from six clinical fields are selected and scores assigned on the completeness of records, diagnostic management, treatment, and reporting. Although performance is measured against prepared standards, the final score depends on the judgment of the consultant making the evaluation.

More recently, another type of combined appraisal was made by Goldmann and Graham (*48*). To an analysis of the availability of service and utilization of service, they added qualitative ratings of the efficiency of service organization and of a random sample of patient records.

Clinical evaluations are in the end subjective and thus less precise than some of the indexes previously discussed. However, they may be more valid since they are a direct approach to the characteristic we want to evaluate, the quality of patient care. Quality, though intangible, is not an abstraction. Nor is judgment of quality capricious or a purely personal whim. While agreement could not be expected to be complete, there are, in numerous situations, widely accepted concepts of what is meant by good care.

The reliability of qualitative judgments can be tested, and they can be subjected to statistical analysis (*49–51*). To make relatively precise estimates of quality, it is necessary to have the findings of several independent judges. This permits an assessment of the degree of agreement among judges (*52*, *53*); it allows for an

objective test of the reliability of the evaluations and diminishes the effect of individual bias. Although more difficult than assessing the precision of interpretations of objective tests, it is the same in principle.

At times, agreement on judgmental evaluation is better than agreement on definitions and criteria. Reynolds (*44*) describes such a case. A group of clinicians attempting to outline criteria for ambulation of patients with infectious hepatitis could not reach agreement after a lengthy discussion of weighting procedures. But analysis of "paired comparisons" by which each man gave his preferences between the criteria in all possible combinations of two, resulted in good agreement on the ranks to be assigned them. Thus, it may be that several clinicians would agree more readily on the relative ranks of a number of hospitals than they would on the weights to be given various objective indexes in computing a quality score.

Judgmental assessments are resorted to in other fields. In some food industry situations the taste of a product must be evaluated. Objective tests give some information, but to answer the important question, "how does a particular process affect the taste," one must in the end resort to tasting the food. If it is necessary to study the effect of different ingredients and preparation procedures on the palatability of ice cream, the only way out is to ask a number of judges which product tastes better to them.

From such tests, valid results may be obtained notwithstanding the problems related to nonagreement among a group of judges and the lack of consistency on the part of an individual judge. The validity is also dependent on such controls as randomization of the tests and the judge's ignorance of which particular product he is testing.

Accordingly, it would appear that appropriate experimental and statistical procedures would enable more meaningful results to be obtained from qualitative evaluation of hospital care. In general, qualitative judgments are expressed through either ranking or scoring.

In ranking, a number of units are placed by each judge in order of his preference and the various ranks analyzed for consistency.

In scoring, a scale of quality is established, and each judge assigns the score that he considers appropriate.

These techniques may be combined in various ways. Thus, individual scores can be given on quality in different clinical fields, and the findings combined into one overall score. The subjects may then be ranked according to the scores obtained.

As already emphasized, the use of these techniques depends on replication, that is, on securing at least two separate evaluations of the same set of units. This is not the same as asking a committee to make a combined appraisal. Only through separate evaluations is it possible to assess the consistency of the individual judgments and to arrive at a relatively unbiased estimate. The value assigned results from combining the different judgments, and is more reliable and objective than the opinion of a single individual. A committee of experts would emerge with one final appraisal, but this would not allow the internal checking suggested. It is even possible with such a panel that one or two members could influence the others so that the final assessment would not be truly a consensus.

If qualitative appraisals of hospital care are made, the particular aspect of care to be studied might be medical, surgical, obstetrical, nursing, social work, or a combination of these and others. Well-qualified, experienced practitioners in the field under study should make the evaluation. Although most clinicians, medical and other, would probably prefer to base their opinions on actual observations of patient care, a properly selected random sample of clinical records may provide adequate information. If various clinical fields were reviewed, replication would be desirable in each field. The evaluations in the major clinical fields could then be crosschecked to test the consistency among them.

It is obvious that such qualitative judgments would have meaning only as comparisons among different hospitals or subdivisions of hospitals. The rank or score would have no absolute value but merely a relative value within the groups appraised. Direct comparisons are unavoidable when we operate without a scale or yardstick. However, this only makes explicit the fact that comparison lies at the basis of all meas-

urement. Measurement has been defined as "the assignment of numerals to things so as to represent facts and conventions about them . . . under a consistent set of rules" (*54*).

The operations to which any measurements can be subjected depend on the rules that can be made and on the validity and reliability of the values obtained. However, with any measurements we make comparisons. If we measure height, we compare the height of the subject with the markings on an arbitrary scale. These markings have meaning only in terms of established norms, of earlier results on the same subject, or of readings obtained from another subject. When we don't have a ruler, we can stand two subjects next to each other and make the comparison directly. Similarly, any index of quality may be measured against a yardstick, or the values obtained on several hospitals may be directly compared.

The Basis of Comparison

Any of the four approaches to quality, therefore, involve comparisons, either indirectly through the use of standards or directly. In program evaluations the basis of comparison is vital. If a specific procedure has an effect on quality, it must be revealed in differences. To find such differences, the hospital under study must be compared with something, either with other hospitals or with itself before inception of the program. When differences exist, it is of paramount importance to isolate differences related to the program itself from differences owing to such other factors as changes in time, economic differences, cultural differences, and so on. The selection of a basis of comparison or control is crucial in this attempt.

The basis of comparison and the indexes to be used, in fact the plan for evaluation of a new procedure or program, should go hand in hand with planning the program itself. Ideally, before the new procedure is instituted, several similar hospitals would be chosen. By random selection, half would become experimental units for the new program, and half, controls (*55*). A careful study of patient care would be made in all the hospitals before instituting the new program and again at a suitable time after the program was in effect. Medical and social progress occurring during this period might produce changes in both experimental and control units. But the changes might be different, and it is these changes that would be compared.

Such an experiment would be relatively simple if it tested only one procedure at a time. Thus one could, for example, estimate the effect of providing small hospitals with special courses for laboratory technicians by comparing changes in the accuracy of their results in certain procedures. More complex programs should also be amenable to this type of experiment.

However, there are cases where this does not apply. The effects of an existing program are to be evaluted, or a hospital plans to embark on a new program, and a study is to be made of quality before and after. The institutions then are self-selected and thereby are different from other hospitals. The before-and-after case does not make the problem simpler. A comparison within the one hospital at two different periods necessitates control of secular changes related to the passage of time or changes owing to extraneous factors that may have come into play.

This situation has parallels in population studies, in public health research, and in clinical research. Analytical studies of what exists, rather than of a planned experiment, call for a more critical evaluation of the findings, and the conclusions must be more tentative. This is even truer when the analyses are retrospective, being made after the fact (*56–59*). However, in some cases it may be possible to select suitable controls for comparison (*60*) and to test their suitability by an examination of variables that might affect the result. The careful selection and critical analysis of the controls (*61*) are basic to the validity of the findings.

An important step in program evaluation, therefore, is the search for suitable controls and for methods of eliminating some of the many variables that affect the quality of care. This is especially difficult because hospitals are highly complex institutions, and patient care is an intangible quality, influenced by many variables.

It is therefore possible that no comparable

units could be found for nonexperimental situations. In the event of failure to establish acceptable controls, or even as a complement to comparisons made with controls, there is another avenue of approach that might prove fruitful. One might formulate a hypothesis such as:

"Characteristic x is usually found only in teaching hospitals. A random sample of nonteaching hospitals in comparable communities will show low values for x, but an examination of hospitals in our group will reveal significantly higher values."

Characteristic x might be laboratory services of a certain type, or rehabilitation services, or one of the quantitative indexes considered. Such an approach, of course, adopts the rest of the country as controls. As in other situations, purely descriptive studies may be used as a basis for planning future experiments.

Many references have already been made to testing the validity of various indexes. This could be done in various ways. One would be through a statistically controlled clinical analysis of each index. Another would be through seeking correlations among various measurements (*37*, *62*) including qualitative appraisals. Thus, correlations might be sought among two or more measurements which are believed to measure practically the same thing. It might be found that a relatively simple, inexpensive objective test showed a high correlation with the results of the qualitative judgments, or, more likely, that a combination of such tests did so. Once the validity and applicability of such indicators were established, there would be many instances where they could be used instead of more difficult, expensive, and cumbersome techniques.

Conclusions

Most of the work done to date in the appraisal of hospital quality has been related to the purposes of correcting abuses, setting minimum standards, and stimulating improvements in quality. The field of program evaluation is just beginning to be explored.

Techniques used in quality evaluations vary with the purposes of the particular study. The quality of care can be evaluated through a multidimensional approach which results in a profile of the hospital. The main basis of the appraisal can be the use of one or a combination of: examinations for prerequisites for good care, indexes intended to measure elements of performance, indexes intended to measure the effect of care by results obtained, and qualitative clinical judgments.

Any indexes and standards used in such appraisals would be clearly defined, based on comparable data, and examined for their reliability and validity. Qualitative clinical appraisals should also be tested in a similar fashion and statistical controls and analysis applied to them as well.

Correlations among different indexes and judgments used should be attempted.

Appraisals which are intended to examine the effects of specific procedures or programs should be planned before the inception of the program.

The selection of an appropriate basis of comparison is crucial to program evaluation.

The development of practical and valid methods of measurement will involve the expenditure of considerable money and time. However, in view of efforts and money now being spent on programs to raise quality, it would seem essential to direct some of those resources toward the development of appropriate methods with which to judge their effects. Collaboration of clinicians, administrators, and statisticians is necessary for such a development.

A critical analysis of the particular methods used should be an explicit objective of a quality evaluation.

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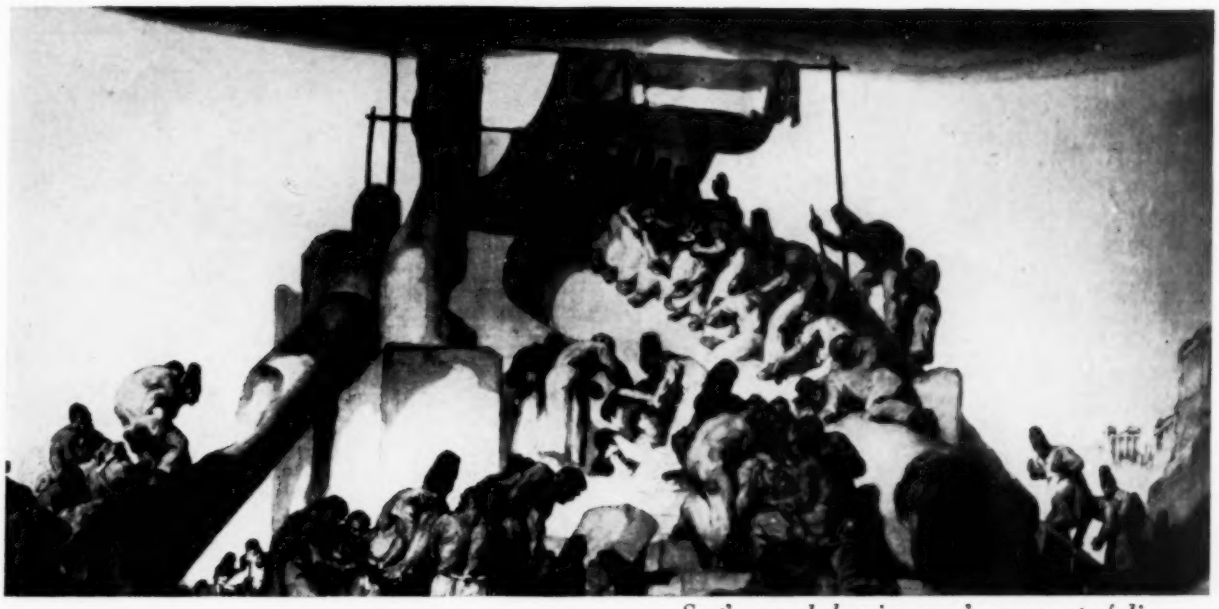

Sert's mural showing man's conquest of disease.

WHO, the Catalyst in International Health

By HENRY van ZILE HYDE, M.D.

WE ARE MEETING here for the next 2 or 3 weeks in a room which is one of the great rooms of the world—the Council Room of the Palais des Nations—a room in which history has been and will progressively be made.

All of us are inspired and uplifted, as we carry on the business before us, in studying the murals by the great Spanish artist, Sert, which surround us. They are to me, as I study them, a record of man's emergence from the primitive. One of our opportunities and privileges is to carry that emergence further along.

We are all aware of the technological ascent represented in the small panel on the right. The rapidity of this ascent indeed underlies many of the problems of our times.

The panel in front of us typifies war and the horrors of war and the triumph of war and the complete distress of war. And here also is man's emergence from bondage. Directly above us is represented man's intellectual progress and the use of reason in cementing nations together in peace.

Over here, on the other side, we see man climbing up in the field of health—our field—man emerging to better things in health and so-

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Dr. Hyde, chief of the Division of International Health, Public Health Service, served as chairman of the Executive Board of the World Health Organization from May 1954 until May 1955. He was first appointed by the President as United States expert on the board in 1948 and reappointed in 1953. Dr. Hyde delivered this address at the board's 15th session in the Palais des Nations, Geneva, Switzerland, January 18, 1955.

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cial well-being. It is particularly important to us to recognize that this panel, which represents disease and man's conquest of disease, is included as part of the whole which symbolizes man's progress toward peace.

Man cannot make progress, cannot emerge to the fullness of his development, carrying a great burden of disease. We have the opportunity to do something about it—that is what we are here for. It is a very unusual opportunity. There are very few men in our profession who have the opportunity to serve on the Executive Board of the World Health Organization—just a handful through a generation of public health progress.

As we enter our deliberations, we should do so with proper solemnity and thoughtfulness. It is proper that we keep in mind, in the light of the Sert panel symbolizing man's freedom from disease, the central significance of health in our work. It is in the title of our organization. It is included in the WHO constitution as our central objective. I think we can recognize that health is a good thing in itself—that there does not need to be any other excuse for health than health itself and what it does in giving scope and range to the mind and the spirit of man.

The Setting for 1955

We are fortunate that in directing our efforts at health we are obtaining certain secondary effects, as byproducts, in economic and social advancement that are essential to total progress toward peaceful and decent living. We all know that we cannot have security in the world—we cannot have peace—without sufficient food for all people, adequate shelter, health, and I think particularly, an ever-widening horizon of opportunity. Man's emergence in technology, intellect, and spirit, which is so dramatically pictured in this room, must continue to provide the ever-widening horizon of opportunity.

Man's emergence is a relatively short story. It was only some 20,000 years ago that he stepped forth from his primeval state and began using tools. Progressively he freed himself from the all-encompassing hunt for food, through the development of planting and the domestication of animals.

The period of his great technological development is a span of only some 4,000 years. It is the familiar story that begins in the Indus Valley, China, Mesopotamia, the Nile, and the Mediterranean. Through the period of technological emergence, there was constant groping for something deeper and more significant. In the millennium marked in midpoint by the beginning of the Christian era occurred the great flowering of the intellect and the spirit. This remarkable millenium included the classical period of Greece with its philosophers and the great moral and spiritual leaders of mankind—the Hebrew prophets, Zoroaster, Confucius, Lao-tse, Buddha, Christ, and Mohammed. It was the period of emergence of spirit and thought.

On the slate of history man seemed to go backwards for awhile, but a resurgence of cultural and intellectual development took place here in Europe in the 14th and 15th centuries. Later came the remarkable intellectual thirst of the 17th century which we see continuing today in the development of new concepts of the universe. That is indeed directly related to the work of this session of the Executive Board. The work of Newton and Galileo led to Einstein and to our present agenda, which includes an item dealing with atomic energy. This new source of power, instead of being a further step in man's emergence, can, if mishandled by you and me and by our generation, be the instrument of man's destruction—his final emergence to his own end.

This is the setting in which we find ourselves dealing in 1955 with the problem of health among men. It is appropriate that as we do so we pause to take a brief look at where our organization stands.

The history of the World Health Organization is an exceedingly brief one. We can find great cause for satisfaction in this history. In 9 years those of us who have had occasion to watch WHO have seen it grow from nothing to real greatness. It has attained stature as one of the great forces among men for good. It has become, on the world scene, a symbol for all that is best in international life: sympathetic under-

The Executive Board of the World Health Organization, January 1955.

standing among men; faith in the worthwhileness of the indivdual; helpfuless, one to the other, without regard to false criteria; and man's full development of body, mind, and spirit.

Probably all of you who have studied the proposed annual WHO program and budget for 1956 (Official Records of the World Health Organization No. 58) have been impressed by the breadth of the work of this Organization, by how it has reached into the remotest corners of the world to places whose names even are new to you and me, despite the fact that we have traveled widely. As one reads the document, one obtains a sense of the reality of the fact that our colleagues, under the leadership of this body and our Director-General, are in myriads of places carrying on the very human work of the world.

Our regional directors, who are with us during this meeting, are closer to these problems than any of us, and they and their personnel are reaching the masses of the people. As a result the World Health Organization is better known to the millions of people in the less privileged areas of the world than any other international agency except perhaps FAO (Food and Agriculture Organization) and our fellow agency UNICEF (United Nations Children's Fund). I am sure that WHO is known and treasured in the hearts of persons to whom the political bodies of the United Nations are remote and incomprehensible unrealities, if indeed they are known at all.

It is encouraging that at the other end of the scale, in the cold and highly critical areas of science, the reputation of the Organization also stands secure. The world's greatest experts in

the medical sciences serve the World Health Organization with pride and readiness on its expert panels and expert committees. There was a recent example of the effect of the reputation of WHO in scientific circles, when, within a matter of a few days, the Director-General was able to bring to Geneva from great distances leading experts and authorities on the medical and biological aspects of atomic energy. There was no question about what WHO was, or where it stood, or what its reputation was. These men responded to the call of WHO immediately. I have seen some of our WHO monographs referred to by critics in responsible journals as classics in their field. In 9 years, to have produced classics in fields of health which are thousands of years old is a great accomplishment and is further testimony to the quality of the scientific work of the Organization.

I might say that in the field of administration also, WHO need bow to no other organization on the international scene. It provides a splendid demonstration of competent public administration in the highly complex environment characteristic of international life. I have had the privilege of working with your Standing Committee on Administration and Finance, and once again I have been tremendously impressed by the quality of the work done in budget planning and preparation and in the fiscal, financial, and administrative management of our organization. I am sure that when you review the reports coming forward from the standing committee, you will share my admiration.

Where the World Health Organization stands now, in these various respects, is indeed a vindication of the concept of the specialized agency within the United Nations framework. WHO is a triumphant example of the wisdom of the men in San Francisco who provided for this type of technical organization within the broad framework of the great political structure they created.

International Leadership

Now, I would like to say something for a moment about WHO and what its proper place is, as I see it, in the public health scene of the world. It is the leader, the stimulator, the catalyst in public health. The object of a local health department is to mobilize and guide the total resources of the community toward the improvement of health. The local health department stimulates the department of education, the department of public works, the many voluntary agencies in the community, the associations, the clubs—all resources in the community—focusing them on the solution of the health problems of that community.

The World Health Organization, the directing and coordinating authority in international health work, as defined in its constitution, serves in this same stimulating leadership role on the world scene. It gives direction and leadership to the development of world health, and in so doing mobilizes all the available resources whether they are within the organization or are within the other specialized agencies, within the United Nations itself, within the voluntary agencies, or within the regional or national agencies devoted to social and economic development.

The annual report of the Director-General every year lists an amazing number of significant conferences in which WHO participates. Through such activity WHO influences many organizations to carry on health work and devote their resources to the solution of health problems which are pertinent to our organization and so stimulates great activity which otherwise would not take place. Further, you are all familiar with the technical conferences organized by WHO, the interregional and regional conferences that it has held on problems such as malaria and yaws, bringing all resources within large areas of the world to bear upon specific health problems.

It is heartening to see also the role that the World Health Organization is playing in regard to some of the bilateral programs of cooperation. It is my privilege to be familiar with the bilateral program of the United States of America, which, as many of you know, is a technical assistance program carried out in cooperation with a number of governments, and which has the same health objectives as the World Health Organization. The relationship between WHO and this program has avoided the pitfalls of possible conflict or duplication to become a truly intimate association with close integration of programs. This has

The Council Room of the Palais des Nations, Geneva, Switzerland.

greatly enhanced the value of both programs but particularly has contributed effectively and continuously to the total development of health in the countries where these programs are assisting in the development of national health activities.

I might cite just an example of how the World Health Organization is exerting its leadership. Many of you will remember that 2 years ago, here in Geneva, the leaders of WHO and of the bilateral program of the United States of America—the Technical Cooperation Administration as it then was—met together in a joint session and discussed objectives. That meeting had a tremendous influence on the course that has been taken by that program. Last year, a similar meeting was held in Panama, covering the Latin America area. At the moment, plans are going forward for a joint meeting of the WHO leadership and the chiefs of the United States bilateral health staffs in some 18 countries in Africa and Asia. The meeting will be held in New Delhi and will consider common problems and common goals of the two programs.

In such ways as this, WHO is giving of its great knowledge and exerting leadership in all health programs that are being carried on at the international level. In no other place is there the concentration of knowledge concerning world health problems that there is in WHO.

A Balanced Health Program

We have already said something about the relationship of disease and health to the economy. Dr. C.-E. A. Winslow in his WHO monograph, The Cost of Sickness and the Price of Health (WHO Monograph Series, No. 7), presented this relationship with great clarity in a document which is among the classics produced by this Organization.

We must move forward in this field and give

our strength and our assistance to the programs of the United Nations in technical assistance for economic development. It is appropriate that when the United Nations has a program directed at economic development and recognizes the need for doing something about health as absolutely basic to that development, we should play an active role and give of our strength and our friendship to that program—not as a supplemental program in health but as an economic program of which health is an integral part.

We all know of the interest that people and their governments have in children: that they have opened their hearts and purses at this time in history to give special help. We, of course, have a keen interest in children, and we have the opportunity of doing special work for children in connection with UNICEF.

Interagency relationships are always complex: They are never entirely smooth. Certainly at the national level we have problems, all of us around the table, with other agencies within our own governments. And, I am sure, they have their problems with us. It is not strange that at the world level, which is even more complex, there should be occasional ripples on the surface. All we need do is to keep our high and total objective always before us—to remind ourselves of our ultimate goal, which is the progress of health.

I believe that we can handle these relationships with no real difficulty if we keep our sights sufficiently high. We must, of course, keep a balanced public health program. We are the agency responsible for total public health progress, and the Seventh World Health Assembly (1954) in its resolution on UNICEF particularly pointed out the need for us to keep that balance. We must be sure that we do not deflect our central resources too far away from our central objective in giving assistance to other organizations. That is a matter of judgment and wisdom which this board is expected to exercise.

During this session we shall be dealing with these matters, and it will be a great opportunity for us, as individuals. We shall be getting better acquainted. I wish to welcome the new members who are among us. I am sure that in a few days we shall all be good personal friends and, at the end of our deliberations, very warm, firm, and permanent friends. That has been the experience of the board, and that is the spirit in which we do our business. Also, we shall have a chance to become acquainted with our great Director-General, with members of his staff, and, when we are particularly fortunate, with their families.

At this point I wish to pay a special tribute, if I may, to the WHO officials and their families. They have in my view the greatness of spirit that allows separations and personal sacrifices and even encounters with danger in the work that means so much to all men in the world.

So I might close by pointing out that the World Health Organization is a team of dedicated people and by expressing the hope that our visit here—yours and mine—may help to strengthen the Organization in its great work. We can be sure, as we settle down to the work in hand, that few undertakings can provide fuller opportunities than does WHO for the peaceful advancement of mankind.

A practicing pediatrician speaks on how physicians can help educate their patients in accident prevention.

Accidents and Poisonings in Children

By JULIAN P. PRICE, M.D.

ACCIDENTS and accidental poisonings are the leading cause of death in this country in children over 1 year of age. This is a condition that we physicians find difficult to accept, accustomed as we are to think of death in terms of disease. But accept it we must for the public expects leadership from the medical profession and from the family physician in matters of health, and any condition which causes 1 death out of every 3 in our children is certainly in the field of health.

Statistics are usually boring and quickly forgotten, so I will present only a few to show the problem which confronts us. It has been estimated that every year in the United States some 2,000,000 children are involved in accidents requiring medical attention. Of this number, 12,000 die—and 40,000 to 50,000 are permanently disabled or crippled. There is no way of determining the number of children who are accidently poisoned, but we know that 1,250 under the age of 21 and 400 under the age of 5 die from this cause each year.

What can the medical profession do, and what can the individual physician do to reduce the toll of accidents and poisonings? In attempting to answer this question I do not pose as an expert, but speak as a practicing pediatrician who has become keenly interested in the subject and who has evolved certain ideas from the writings of others and from his own personal experience.

Dr. Price is a practicing pediatrician in Florence, S. C., and pediatrician at the McLeod Infirmary in Florence. This address was given at the annual meeting of the American Academy of General Practice in Los Angeles, February 1955.

Fields for Action

There are three special fields in which we should exert our efforts. First, we need studies and investigations to give us more basic information. Research on accidents in adults has been conducted for some time, but only recently has study been made of accidents in children. What has been done has been encouraging and enlightening—such as the work of Press, Wheatley, Dietrich, Arena, Shaffer, Dennis and Kaiser, and others—but we need more.

One phase of the problem which needs particular attention is that of the accident-prone individual. Langford and his associates have made a preliminary report on the study of nine such children. No definite conclusions can be drawn from this small number, but some of the observations and ideas offered are most suggestive. It is to be hoped that the work will be continued and enlarged. It is extremely important that we be able to recognize and help the accident-prone child before rather than after he runs into trouble.

The physician needs help to handle acci-

dents and poisonings more effectively. This is a second field of activity which needs developing. If a child cuts his leg, the accepted procedure is to clean the wound, suture it, and give tetanus toxoid or antitoxin. But when a child is extensively burned, the problem of what to do is not so simple. Should the burn be cleaned? If so, how? Should the child be given a general anesthetic? What type of dressing should be applied? Does the child need sedation, plasma, electrolyte or glucose solution, or blood? Upon the answer to these questions may depend the life of the child.

When a little boy drinks kerosene—one of the more popular drinks among children these days—a recognized method of treatment is to empty the stomach, give an antibiotic, and watch for signs of chemical irritation of the lung. But what of the little girl who eats rat poison? What is the toxic ingredient in this particular preparation? Is there an antidote? What are the complications to be watched for? An immediate answer to these questions will help materially.

Burns, fractures, penetrating wounds, lacerations, shock, intracranial hemorrhage, and ruptured viscera are some of the conditions which may be encountered in the accident patient. Roach powder, pesticides, medicines, floor polish, moth balls, cosmetics are but a few of the poisons which may be eaten by the little child.

To help the physician to be more effective in his care of victims of accidents and poisonings, I would suggest that more time be given to these conditions in the training of interns, in general meetings such as this, and in postgraduate courses for the general practitioner and for the pediatrician. Further, I would urge that every doctor's office and every emergency room in a hospital have available for quick reference not only a textbook on traumatic surgery but also 1 or 2 reference books which discuss the common household items which might be implicated in poisonings. Two such volumes which I have found valuable are Symptoms and Treatment of Acute Poisoning by G. H. W. Lucas, and Handbook of Pediatric Medical Emergencies by Desanctis and Varga.

A recent development which should prove of considerable value in the realm of accidental poisonings is the establishment of poisoning control centers in our larger communities. The first such center is now in operation in Chicago, and others are being established in Boston, New York, and Cincinnati. These centers will treat poisonings, conduct special studies as to their cause, and promote their prevention. They will also serve as information centers to which the practicing physician can turn for help at any time.

The third field of activity to which we must bend our effort is that of education. The only way in which we can hope to reduce the number of accidents and poisonings in children is through prevention, and prevention hinges on educating the public about the need and methods of forestalling accidents.

Many national organizations have engaged in educational efforts—the National Safety Council, the American Automobile Association, the American Red Cross, the National Board of Fire Underwriters, and the National Committee for Traffic Safety. Public health associations have carried on special campaigns. The American Academy of Pediatrics, through its Committee of Accident Prevention, has promoted State and local conferences. It has stimulated the formation of accident prevention committees, and, with the assistance of the Metropolitan Life Insurance Company, has prepared a number of educational pamphlets. The American Medical Association has long been concerned with accidental trauma and more recently has entered the field of poisonings through its Committees of Toxicology and Pesticides.

These organizations and others have done yeoman service, and they need our thanks for what they have accomplished and our support as they continue their work. But their efforts alone are not sufficient. They must be joined by that individual who, in my opinion, is the greatest single source of strength in our educational effort, the practicing physician. It is he who can most easily influence the two key individuals in our war against accidents and poisonings—the parent and the child.

It is my sincere hope that medical organizations will spearhead an educational effort in which the parents of America, along with their children, will be taught the fundamentals of

preventing accidents and poisonings. This education should be carried on where it will be most valuable—in the office of the physician and in the home of the child. And it should be carried on by the one whose word would be most heeded—the family physician.

What Physicians Can Do

There are a number of ways in which the practicing physician can participate in such an educational effort. I would like to make six specific suggestions—suggestions culled from the experience of others and from my practice.

The physician must become safety-minded in the prescribing of drugs. Specific instructions should be given to the family and to the druggist. The mother should be told what the drug is for and how it is to be given. General instructions on the label should be avoided. "A spoonful as needed," may be understood the day it is prescribed, but a month later the parents may have forgotten the indications for its use as well as the size of the spoon, with regretful results.

The amount of a drug prescribed should be limited to a quantity sufficient for 2 or 3 days only. Recently I saw a prescription written for 6 ounces of a sulfa preparation for a child with a mild upper respiratory infection. I pictured what might happen. The child would probably be well by the time he had taken 2 or 3 ounces. The half filled bottle would then be put in the medicine chest or on the windowsill in the bathroom. There it would sit until it could be used for some subsequent illness in the family, or else it would be found by some adventuresome youngster and gleefully drunk.

I may or may not have been right in this particular instance, but I know that the medicine closets of many families in this country are cluttered with bottles half filled with medicine or boxes partially filled with tablets which are potential poisoners of children. To prescribe only what is needed for a specific illness and that only for a specific period of time is good medicine—it is also one of the first steps in preventing drug poisonings.

The physician should take time to discuss accidents and poisonings with parents when they bring their children to his office. This is of particular importance when the child is between the ages of 1 and 4—the danger age. Mention should be made of the type of activity in which the child is likely to participate such as crawling, climbing, investigating with the fingers, and putting objects in the mouth. The parent should be shown how these activities can lead to trouble if ordinary precautions are not taken.

Attention should be called to the special care which should be taken near such items as stoves, floor furnaces, hot water, stepladders, and electrical outlets. The need for keeping such articles as liniments, medicines, fingernail polish, floor wax, and insecticides in a place where the child cannot get to them should be emphasized. The parents should be urged to make a survey of the yard and playground to see that hazards such as broken glass, wooden stakes, and sharp tools are not present.

The children themselves should be talked to about accidents and poisonings. Many a youngster will listen with more attention to his doctor than he will to his parents. They should be told of the need for staying out of the street, of the care which they must exercise when riding tricycles and bicycles, of the dangers of playing with matches and firecrackers. They should be warned against taking medicines of their own accord. Older children, particularly boys, should be told of the need for caution with regard to swimming and diving—never to go swimming alone and never to dive into unknown water.

Literature should be available in the physician's office for parents to read and to take home for study. Quantities of home and child safety materials are available from many of the major insurance companies. Pamphlets on specific phases of safety education can be obtained from the National Safety Council. An excellent checklist for parents has been prepared by the American Academy of Pediatrics. Published information of this type, or perhaps material especially prepared by the American Academy of General Practice, needs to be placed in every general practitioner's office. There is no telling how much of this would be read, but I have yet to see a parent who did not appreciate an article or pamphlet on safey when I presented it with the request that it be taken home and studied.

The physician should investigate the home and yard environment when making calls. Are the stairs safe for the youngsters? Are there proper safeguards around the stove and fireplace? Are cigarette lighters or matches lying within easy reach of the children? Are the window screens securely fastened? Is there a special place for medicines?

These are but a few of the questions which the physician with a keen eye and inquiring mind will ask himself as he goes in to see the sick child. From what he sees, the physician can give pertinent advice to the parents.

The physician must become a crusader in the cause of accident and poison prevention. He must convince himself that accidents and poisons are the number one problem in child health today—and then convince others. In the office, in the home, at meetings of the PTA, in public gatherings, whenever and wherever the opportunity presents itself, he must discuss the problem and enlist the support of others.

Typhoid fever was not eradicated with the discovery of typhoid vaccine; it only disappeared as the public was made to understand the value of the vaccine and was willing to have it injected into them. In the same way, accidents and poisonings will not be diminished materially through programs and studies. They will only be reduced as those who are primarily concerned—physicians, parents, and children—appreciate and understand the problem and put into practice those measures which are needed to bring about a change.

There is nothing unusual or dramatic in the suggestions presented—it is the accident and not its prevention which is sensational. I am convinced, however, that if every member of this great organization would put these suggestions into effect there would be a marked reduction in the number of accidents and poisonings in children.

In conclusion, I would like to stress the need for joint effort in our fight against the number one killer of our children. The task is too large for any single organization or for any group of individuals. It challenges the combined effort of all. Local, State, and national organizations now in the field must be encouraged to continue and to increase their efforts. Medical associations such as the American Academy of General Practice, the American Academy of Pediatrics, and the American Medical Association must be urged to further activity. Above all, the practicing physician who deals with parents and with children must be made aware of the problem and be stimulated to join his colleagues in an all-out campaign of education in this fight for the safety and welfare of our boys and girls.

Cardiovascular Training Center for Nurses

A pilot cardiovascular training center for nurses, the first of its kind, will commence operation January 1, 1956, at the University of Minnesota School of Public Health, according to present plans.

Cooperating in the project with the Public Health Service and the University of Minnesota are the Minnesota Department of Health and other agencies in Minneapolis and St. Paul which will offer trainees field experience in special services for cardiovascular patients.

The center expects to give nursing leaders a better understanding of new developments in the cardiovascular field and methods of applying them to the nursing care of patients, both in the home and hospital.

Applications for the training center are being received at the University of Minnesota School of Public Health, Minneapolis.

Limitations of Water Treatment Methods for Removing Radioactive Contaminants

By CONRAD P. STRAUB, Ph.D.

RADIOACTIVITY has been known since 1896, when Becquerel first observed the phenomenon by its effect on photographic plate. However, until the first controlled nuclear chain reaction was demonstrated, the supply of radioactive materials was limited, and the opportunities for large groups of the population to be exposed to significant amounts of radiation were small. Since 1942, many kinds and considerable quantities of radioisotopes, many of high specific activity, have been produced in nuclear reactors.

Increased use of radioisotopes in recent years has resulted in the discharge of these materials to the environment. A 1954 report, based on a questionnaire sent out in December 1952 to 1,027 users of radioisotopes, showed that about 41 percent of them disposed of radioactive wastes by dilution and discharge to the sewers (*1*). In all probability, the amounts of radioactive materials used will increase many fold over the amounts employed now, as additional applications are developed. An increase in the amounts used will, in turn, result in the release of a greater variety of radioisotopes, as well as greater quantities of radioactive materials. At present, considerable effort is being expended in developing nuclear energy as a source of power. These developments will aggravate the waste disposal problem and will add emphasis to the statement made in 1951 by Mark D. Hollis, chief engineer officer of the Public Health Service, that public health officials will be responsible for protecting the public against the harmful effects of ionizing radiations (*2*).

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Maximum Permissible Concentrations

Ionizing radiations, which result from the disintegration of unstable nuclei, are damaging to living tissues. The extent of damage from internal exposure to radiation depends on many factors, some of which are the quantity of radioactive material deposited in the body; the point of localization; the type of radiation (alpha, beta, or gamma); chemical state of the isotopes deposited in the body; energy of the radiation; and the physical and biological half-lives of the isotopes. These factors and others are considered in establishing the maximum permissible amounts of radioisotopes in the human body and the maximum permissible concentrations in air and water. Maximum permissible amounts in the body and maximum permissible concentrations in the environment are summarized and reported in a handbook published by the National Bureau of Standards (*3*).

The maximum permissible concentration

(MPC) values serve as a guide to the public health official in determining the levels of radioactive materials that may be discharged from various installations and the amounts of these materials that may be permitted in the air we breathe and the water we drink. They represent the best available information on permissible concentrations of radioactive materials in the environment. It should be noted that these values have been derived on the assumption that the contaminated supply is the sole source of supply during the lifetime of an individual (taken as 70 years). Further, it is assumed that these values are superimposed on the natural background radiation of the particular area under study.

Comparison With Other Contaminants

The Drinking Water Standards promulgated by the Public Health Service define limits for specific materials in waters used for drinking on interstate carriers. In table 1 are shown some of these limits and the maximum permissible concentrations in water of similar radioisotopes. It can be seen that the concentrations permitted on the basis of radioactivity are many orders of magnitude lower than safe or acceptable concentrations of the stable isotopes of the same element. These extremely low concentrations present a problem of identification, since ordinary qualitative and quantitative procedures are of little value in detecting and identifying the presence of such minute concentrations of specific radioisotopes. However, because these materials are radioactive, it is possible to use this characteristic to detect, measure, and identify them. The radiochemical procedures used to identify specific radioisotopes, however, become less accurate as the number of different radioactive constitutents present increases.

A characteristic of radioactivity that should be mentioned, in order fully to understand the difficulties in handling these materials and removing them from waters to make them safe for normal use, is that the rate of disintegration cannot be altered by any physical, chemical, or biological process. Other polluting substances can be removed or modified so that they are no longer noxious: For example, chromium or other heavy metals may be eliminated by precipitation; cyanides may be treated with chlorine to form the relatively nontoxic cyanate, which may decompose further to ammonium carbonate; or pathogenic bacteria may be de-

Table 1. Quantitative comparison of limits set by Public Health Service Drinking Water Standards and maximum permissible concentrations of radioisotopes in water

Chemical constituent	Drinking water standards		Maximum permissible concentration		Radioactive form
	p.p.m. (mg./l.)	μg./cc.	μg./cc.	μc./cc.	
Grounds for rejection					
Lead (Pb)	0.1	1×10^{-1}			
Fluoride (F)	1.5	1.5×10^{0}			
Arsenic (As)	.05	5×10^{-2}			
Selenium (Se)	.05	5×10^{-2}			
Chromium (Cr^{+6})	.05	5×10^{-2}	5.2×10^{-6}	0.5	Cr^{51}
Recommended values					
Copper (Cu)	3.0	3×10^{0}	2.1×10^{-8}	8×10^{-2}	Cu^{64}
Iron and manganese (Fe+Mn)	.3	3×10^{-1}	1.8×10^{-6}	4×10^{-3}	Fe^{55}
			2.1×10^{-9}	1×10^{-4}	Fe^{59}
			9.3×10^{-9}	0.2	Mn^{56}
Magnesium (Mg)	125	1.25×10^{2}			
Zinc (Zn)	15	1.5×10^{1}			
Chloride (Cl)	250	2.5×10^{2}	8.9×10^{-2}	2×10^{-3}	Cl^{36}
Sulfate (SO_4)	250	0.83×10^{2} (as sulfur)	1.2×10^{-7}	5×10^{-3}	S^{35}
Phenolic compounds (C_6H_5OH) [1]	.001	[1] 1.5×10^{-4}	6.7×10^{-4}	3×10^{-3}	C^{14}

[1] Assuming that only one of the carbon atoms is radioactive carbon-14.

stroyed by disinfection, pasteurization, or sterilization. All that can be done with radioactive wastes is to transfer the radioactive component from one phase to another: The soluble materials, for example, may be removed by precipitation, adsorption, and the like. The radioactive fraction remains for disposal. Thus far, the only real solution, and it is a tentative one, is storage, and this is the method now used to dispose of high-level wastes. The less hazardous and low-level wastes may be discharged into surface waters or into the ground. When discharged into the ground, the wastes may come in contact with the ground water and move slowly with it, and some of the radioactive materials may be removed by adsorption on the soils through which the waste stream and ground water flow.

Basic Principles

The efficiency of conventional water treatment processes for the removal of radioactive contaminants must be geared to the MPC values. Since these values define the accepted permissible levels of contamination, they may be used to calculate the degree of removal that must be provided to meet these levels when the nature and the amount of activity initially present are known. For example, if a water supply contains 10μc./ml. of promethium-147 and the MPC value for this substance is 1μc./ml., treatment which will result in removal of 90 percent of the promethium must be provided. Or, if the efficiency of a particular process and the MPC value are given, the maximum concentration of that component in the waters used for public water supplies can be stipulated. For strontium-89, for example, with an MPC value of 7×10^{-5} μc./ml. and a process that results in 90 percent removal of this substance, the highest concentration that may be present in the waters to be treated is 7×10^{-4} μc./ml. The difference in the initial concentrations of promethium-147 and strontium-89 varies by a factor of approximately 14,000 and is due entirely to the difference in their MPC values.

Conventional water treatment processes include coagulation, settling, filtration, and disinfection. In addition, auxiliary treatment, such as aeration, softening, and iron and manganese removal, may be used. Any discussion of treatment methods must take into account the fact that radioactive and stable isotopes of an element behave identically during chemical treatment. Thus, if the conventional process is not designed to remove a specific element, there is no reason to believe that the process will remove the specific radioisotope. Radioactive calcium, barium, or strontium, for example, will be significantly removed by softening, since the purpose of softening is to remove calcium. Barium and strontium will be removed with calcium, because of their similar chemical properties.

To show the limitations of conventional water treatment methods for the removal of radio-

Table 2. Removal of radioisotopes by coagulation and settling: results obtained in jar-test studies

Radioisotope	Clay added [1] (p.p.m.)	Coagulant added [2] (g.p.g.)	Final pH	Percent removal
Cesium-137—barium-137	0	1	----------	0–6
	100	1	----------	35–65
Strontium-89	0	[3] 1.5	6.7–7.8	0–6
	100	0.5–6	6.7–10.7	0–51
Cadmium-115	0	1	----------	40–60
	100	1–5	----------	60–95
Barium-140—lanthanum-140	100	1–6	7.5–8.2	28–84
Scandium-46	100	1–6	6.5–8.2	66–98
Yttrium-91	0	[3] 1.5	6.8–7.1	83–93
	100	1–6	7.0–10.2	34–99
Zirconium-95—niobium-95	0	1–5	----------	70–98
	100	1	----------	95–99
Phosphorus-32	100	[3] 0.5–1.5	6.8–8.8	97–99
Chromium-51	100	1–6	7.6–8.8	73–98
Tungsten-185	100	1–6	7.5–8.4	5–91
Iodine-131	100	[3] 0.5–2	6.9–9.0	0–10
Cerium-144	0	[3] 1–1.5	7.2–7.8	81–94
	100	[3] 0.5–2.5	7.0–7.8	85–96
FPM-1 [4]	100	[3] 1–3	7.2–8.8	61–84
FPM-2 [5]	0	1–5	4.3–10.2	9–71
	100	1–5	4.3–10.2	12–73
FPM-3 [6]	0	10	9.9–10.0	46

[1] Local clay was added.
[2] Coagulant includes alum, ferrous sulfate, or ferric chloride; lime, soda ash, or sodium hydroxide; and sodium silicate.
[3] No sodium silicate added. Where added sodium silicate equals 40 percent primary coagulant dose.
[4] Iodine dissolver solution.
[5] Synthetic mixture containing fission products in the same concentrations assumed to be present 30 days after an underwater bomb blast.
[6] 3-year-old fission product mixture.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

Table 3. Removal of radioisotopes by sand filtration: results obtained in laboratory tests

Radioisotope	Initial activity (c./m./ml.)	Volume passed (ml.)	pH of effluent	Percent removal	
				Range	Average
Cesium-137—barium-137	800	500	8.3	10–70	50
Strontium-89	2,700	750	8.3	1–13	4
Cadmium-115	1,200	500	8.1	60–99	95
Barium-140—lanthanum-140	1,300	750	7.6	39–99	74
Scandium-46	1,500	750	8.3	94–99	96
Yttrium-91	5,700	750	7.0	84–89	87
Zirconium-95—niobium-95	3,400	500	7.8	91–96	93
Tungsten-185	2,200	750	7.1	3–18	8

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

active materials, the results of experimental work at Oak Ridge National Laboratory, which has been carried out in cooperation with the Public Health Service and the Engineer Research and Development Laboratories at Fort Belvoir, Va., and of studies reported in the literature are cited.

Coagulation

In coagulation, certain soluble constituents are precipitated as insoluble hydroxides or are carried along with the heavy metal hydroxides that are formed when alum or iron salts are used. With the exception of most cations of valence 3, 4, or 5, including the rare-earths group, coagulation has not been very effective for the removal of radioactive materials from water (*4*). Phosphorus-32 has been removed from waters contaminated with this radioisotope (*4*, *5*), but considerable care had to be given to the coagulation step (*5*). Removals in excess of 98 percent have been reported. Iodine-131, which is in the form of an anion, cannot be removed by coagulation with alum or iron. However, the addition of small amounts of activated carbon (*4*), copper sulfate (*4*), or silver nitrate (*4*, *6*) has been found to increase the removal of this anion to about 96 percent. Other data are reported in table 2.

Coagulation is also helpful in the removal of radioactive material attached to or adsorbed on the natural turbidity found in many surface waters. Since coagulation will remove much of the turbidity, the activity attached to it will also be removed.

Sand Filtration

Except for removal by simple straining or sorption by the biological life contained in the *Schmutzdecke* sand filters, as shown in table 3, have not been effective for the removal of radioactive materials (*7–9*). Their major function is to remove the radioactivity previously incorporated in floc particles.

Softening

Softening with lime and soda ash has been studied (*9–12*) and, under proper conditions, effective removals of radioactive strontium, barium, cadmium, yttrium, scandium, and zirconium-niobium have been obtained (*9*). As shown in table 4, removals of 95 to 99 percent or better have been accomplished. For the most satisfactory removal of strontium, excesses of both lime and soda ash are required (*10*). Some recent studies have indicated that the strontium is removed by coprecipitation (*10*, *11*) with the calcium carbonate by the mechanism of mixed crystal formation (*11*). Data on the removal of stable strontium from municipal water supplies (*13*) are given in table 5.

Ion Exchange

Another method of softening that has been practiced for some time in municipal and industrial water treatment is ion exchange. Removal of radioactive materials by this process is technically possible (*12*, *14*, *15*). For most effective removal, mixed bed or cation and anion exchange beds in series are recommended. Results obtained with various types of synthetic exchange materials and with greensand (*9*), a material which has found considerable use in municipal softening installations, are shown in table 6. For adequate removals and economic operation, the waters to be treated should be low in dissolved solids. Experience in the laboratory has shown that certain radioactive mate-

Table 4. Approximate minimum combined dosage [1] of lime and soda ash to give stated percentage removal of radioisotopes

Radioisotope	50 percent removal		75 percent removal		90 percent removal		95 percent removal		99 percent removal	
	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)
Barium-140—lanthanum-140	2	2	4	2	6	4				
Strontium-89	4	3	5	5	7	9	20	20		
Cadmium-115	2	2	3	3	4	4	4	4	6	4
Scandium-46	3	3	3	3	5	5				
Yttrium-91	2	2	4	4	6	6	12	6		
Zirconium-95—niobium-95	2	0	5	0	12	0	17	0	22	0
Cesium-137	48	48								
Tungsten-185	48	48								

[1] Minimum combined dosage is defined such that, of those variable dosages studied, the grains per gallon of lime plus the grains per gallon of soda ash is a minimum.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

rials will continue to be removed (about 50-percent removal) even though the column has been saturated with calcium and the hardness is no longer reduced.

Modified Processes

Several modifications of existing water treatment processes have been studied in an effort to obtain better removals of specific radioactive materials. The most promising of these has been phosphate coagulation (*16*, *17*), as indicated by the data in table 7. For many of the radioisotopes of interest, including strontium-89, relatively high percentage removals have been obtained, but for strontium-89 the

Table 5. Removal of stable strontium by chemical treatment

Type of treatment	Percent removal		Number of cities
	Average	Range	
Alum or ferrous sulfate	12	10–31	7
Alum or ferrous sulfate, plus lime	37	10–75	11
Alum or ferrous sulfate, plus lime and soda ash	54	10–85	3
Alum or ferrous sulfate, plus lime and phosphate	42	10–70	5
Softening only (phosphate, ion exchanger)	73	69–76	2
None (except chlorine, fluoride, carbon, or ammonia)	10		8

Table 6. Percentage removal of individual radioisotopes with ion exchange materials

Radioisotope	Cation exchange	Anion exchange	Mixed bed	Greensand
Tungsten-185	12 –16	97. 2–99. 2	98. 9	9
Yttrium-91	86 –93. 1	94. 2–98. 5	97. 6 –98. 7	75
Scandium-46	95. 7–97. 2	98. 8–99. 0	98. 5 –98. 7	96. 4
Strontium-89	99. 1–99. 8	5 – 7	99. 95–99. 97	99. 8
Barium-140—lanthanum-140	98. 3–99. 0	36 –42	99. 5 –99. 6	96. 3
Cesium-137	99. 8	9	99. 8	
Cadmium-115	98. 5	0	99. 2	
Zirconium-95—niobium-95	58 –75	96. 4–99. 9	90. 9 –99. 4	

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

Table 7. Removal of radioisotopes by phosphate coagulation

Radioisotope	Coagulant	Coagulant dose (mg./l.)	Percent removal
Cerium-144	KH_2PO_4	200	99. 8
	Na_3PO_4	120	99. 9
Strontium-89	KH_2PO_4	100	81. 3
	Na_3PO_4	240	97. 8
Yttrium-91	KH_2PO_4	100	99. 9
Antimony-124	KH_2PO_4	100	66. 1
	Na_3PO_4	120	67. 4
Zinc-65	KH_2PO_4	50	99. 6
Tungsten-185	KH_2PO_4	200	10. 7
Zirconium-95	KH_2PO_4	100	99. 5
Niobium-95	KH_2PO_4	100	99. 2

results were obtained under carefully controlled conditions of pH and the calcium-hydroxide/trisodium-phosphate ratio. Other methods that have been suggested for the removal of radioactive materials from water include the use of metal powders (*18*) and added clay (*4, 19*). Results obtained with these materials are given in tables 8 and 9.

Evaporation

Although not a municipal treatment method, evaporation is included in this discussion because it is the most effective process available at present for producing waters low in radioactivity. High decontamination factors are possible, but the cost is great. However, under emergency conditions, evaporation should prove to be very satisfactory.

Removal of Mixed Fission Products

The discussion thus far has centered on the removal of specific radioisotopes from waste solutions. For a fission products mixture or any mixture of radioisotopes, the efficiency of removal is a function of the individual radioisotopes comprising the mixture. To date, removals of mixtures in the order of about 70 to 80 percent have been obtained with alum or iron coagulation (*4*). A series of studies on actual process waste waters at Oak Ridge National Laboratory disclosed that up to 90 percent of the contaminants could be removed with excess lime-soda ash softening or with phosphate coagulation when coupled with the addition of clay, which is specific for the removal of the cesium in the waste. Experimental results in removing fission products mixtures are summarized in table 10.

Table 8. Removal of radioactive contaminants by metallic dusts

[1,000 p.p.m. metal dust, 90 minute contact, filtered sample counted]

Contaminant	Stock solution pH	Initial activity (c./m./ml.)	Percent removal			
			Iron [1]	Zinc	Copper	Aluminum
Ruthenium-106—rhodium-106	8. 0–8. 2	1, 975– 3, 950	99. 6	98. 4	93. 7	92. 8
Yttrium-91	7. 9–8. 0	1, 610– 3, 230	98. 0	98. 0	-------	-------
Zirconium-95—niobium-95	7. 2–8. 3	1, 210– 4, 470	99. 1	97. 9	99. 1	99. 8
Phosphorus-32	7. 8–8. 4	128–12, 000	99. 8	98. 1	-------	84. 2
Iodine-131	6. 5–8. 2	4, 288– 6, 689	37. 2	45. 7	42. 2	23. 2
Cerium-141, -144—praseodymium-144	7. 9–8. 1	3, 915– 4, 491	99. 9	99. 9	99. 5	99. 8
Barium-140—lanthanum-140	7. 9–8. 2	4, 644–10, 205	94. 8	74. 5	65. 7	73. 8
Cobalt-60	8. 0–8. 2	1, 571– 4, 792	[2] [3] 92. 2	-------	47. 8	[3] 30. 2
FPM-6 [4]	7. 2–8. 0	4, 730–10, 375	85. 8	76. 6	92. 1	89. 4
FPM-5 [5]	2. 0–7. 2	2, 890– 4, 220	55. 5	39. 6	49. 3	8. 2
Cesium-137—barium-137	8. 0	13, 085	8. 6	-------	-------	-------

[1] Iron samples were centrifuged before counting.
[2] 500 p.p.m. metal dust.
[3] 60-minute contact.
[4] Iodine dissolver solution aged 20 days.
[5] Mixed fission product waste containing mainly cesium-137—barium-137, and ruthenium-106—rhodium-106.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

Table 9. Effect of added clay on removal of radioisotopes [1]

Radioisotope	Percent removal		
	100 p.p.m.	750 p.p.m.	5,000 p.p.m.
Barium-140—lanthanum-140	41	58	85
Cadmium-115	3	30	64
Cerium-144	70–80	86	
Cesium-137	38	87	98. 0
Scandium-46	53	91. 7	96. 9
Strontium-89	2–12	14–22	49–52
Tungsten-185	0	4	49
Yttrium-91	22–45	56–70	93. 6
Zirconium-95—niobium-95	93. 5	99. 0	98. 0

[1] Local clay added to produce turbidity.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

Table 10. Removal of mixed fission products

Mixture	Treatment process	Percent removal
FPM-1 [1]	Coagulation and settling plus clay.	61–84
FPM-2 [2]	Coagulation and settling	9–71
	Coagulation and settling plus clay.	12–73
	do	46
	Coagulation and settling plus filtration plus clay.	70–73
FPM-3 [3]	Coagulation and settling	46
FPM-4 [4]	do	89
	Mixed cation-anion exchange slurry.	83–99
FPM-5 [5]	Coagulation and settling	51–59
	Mixed cation-anion exchange slurry.	38
	Metallic dust slurry	8–56
FPM-6 [6]	do	77–92

[1] Iodine dissolver solution.
[2] Synthetic mixture.
[3] 3-year-old fission products mixture.
[4] Iodine dissolver solution aged 30 days.
[5] Mixed fission product waste containing mainly cesium-137—barium-137 and ruthenium-106—rhodium-106.
[6] Iodine dissolver solution aged 20 days.

Summary and Conclusion

Laboratory studies have shown that conventional water treatment processes may remove varying percentages of radioactive contaminants from water. However, the percentage removal values have little meaning unless they are related to the initial concentration of the radioactive materials present and to the maximum permissible concentration value prescribed for the individual radioisotope. Generally speaking, unless the initial concentration is very low, certainly several orders of magnitude below the microcurie-per-milliliter range, water treatment processes will be ineffective for reducing radioactive contaminants to acceptable safe limits.

Radioactive materials should be retained as close to their source of production as possible. At present, the practice is to store the materials in tanks. The transfer of radioactivity from the liquid to the solid phase does not eliminate the problem, since suitable storage facilities still must be provided for the radioactive sludges, but it does reduce considerably the area of potential contamination.

To protect large centers of population that depend on sources of water which may become contaminated with radioactive materials, plans should be made now for supplying water from noncontaminated sources. For this purpose, existing ground water supplies may be used; other interconnected water supplies may be piped in; or special provisions should be made to bring in water from outside the area. These precautionary measures are applicable, however, only when radioactive contamination is not great enough to constitute an external hazard to man.

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PHS exhibit

A new exhibit, Social Workers Help Heart Patients, prepared by the Public Health Service in cooperation with the American Heart Association, is now available.

The exhibit is designed to stimulate and extend social services to heart patients. It is suitable for use at social work, heart association, medical, nursing, hospital, welfare, and other professional conferences and health fairs.

Shown for the first time at the National Conference of Social Work in June at San Francisco, the exhibit is approved for use by the American Association of Medical Social Workers. It was produced by the Heart Disease Control Program of the Division of Special Health Services, Bureau of State Services.

Specifications: 3-panel exhibit on legs, 7 feet high, 9 feet wide. Total shipping weight 75 pounds. Borrowers must pay insurance and shipping costs both ways. Available with educational materials through local heart associations, the American Heart Association, 44 East 23d Street, New York 10, N. Y., or the Heart Disease Control Program, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington 25, D. C.

Progress in Reporting Mental Hospital Statistics

Fifth Annual Conference of Mental Hospital Statisticians, Bethesda, Md., May 25–26, 1955

DEVELOPMENTS in the field of mental hospital statistics and plans for future activities were the major areas of discussion at the Fifth Annual Conference of Mental Hospital Statisticians in Bethesda, Md., May 25–26, 1955, held under the sponsorship of the National Institute of Mental Health, National Institutes of Health, Public Health Service.

The conference was attended by delegates from the 17 member States forming the Model Reporting Area for Mental Hospital Statistics, and by unofficial observers from 7 other States and a representative of the Veterans Administration (see inset).

Emphasizing the contribution of State statisticians in collecting and publishing data, Dr. R. H. Felix, director of the institute, called attention to signs of the Nation's awakened interest in the whole area of mental health. The legislature in New York State has appropriated a considerable sum of money to be matched with local funds, for the development of a large-scale community mental health program. Other States may follow this precedent. Indications of increased interest are also seen at the Federal level, he reported.

Prepared by the Current Reports Section, Biometrics Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service. The 1954 conference was reported in the September 1954 issue of Public Health Reports, p. 809.

This heightened desire to do something about an age-old problem has brought the realization that trained personnel, particularly biostatisticians, are in short supply. It is urgent that State mental hospital administrators provide statistical programs with much needed personnel and equipment and that they recognize the key position of the statistician in the fight against mental illness.

Recommended Cohort Studies

The Cohort Study Committee, appointed at the 1954 conference, reported on the types of uniform cohort studies to be produced by members of the model reporting area and the types of tabulations which should be required of these States.

Cohort studies, in a mental hospital, are studies in which groups of patients with common characteristics—these might be first admissions of a specified year with given age, sex, and diagnosis—are followed from the date of admission through their hospital experience to a specified end point, such as trial visit, discharge, or death, in order to determine their disposition within specified periods of time after admission.

The committee agreed that the analytical procedures involved in cohort studies are appropriate to the mental hospital situation and that all approaches to these studies are based on simple, basic movement data, which can be calculated manually—a particular advantage if

the hospital does not have access to machine tabulation equipment. Cohort studies permit development of a series of release, death, retention, and readmission rates; they permit more accurate prognoses on groups of patients for the benefit of the medical staff, the patients' families, and others.

Properly designed cohort studies can be used by a State desiring to evaluate its mental hospital operations, for program evaluation and budget justification, for evaluation of different therapeutic programs, for interhospital and interstate comparisons, and for many important areas of research.

The committee recommended that all model reporting area States attempt to develop cohort studies. Earlier in the conference only a few delegates had reported preliminary attempts to analyze data on hospital admissions on a cohort basis.

The recommended studies would be studies of first admissions over a 3-month period (preferably April, May, and June) in a given year or longer, if the longer time is required for adequate sample size. The committee suggested that all States adopt the cohort study approach used at the Warren State Hospital, Warren, Pa., and that States with adequate mechanical facilities and sufficient staff undertake in addition the types of studies made by the Ohio Department of Welfare. When data are recorded in sufficient detail, States might consider producing cohort studies where both the Warren and Ohio approaches are used.

By tracing the outcome of hospitalization of patients admitted over the past 40 years, the Warren study has furnished a veritable gold mine of information to the hospital, the State legislature, and the public. The approach is that of followup from date of admission to date of first significant release, with tabulations by number of months of hospital residence. With this type of study, one can answer the question: What proportion of first admissions will have attained their first significant release within the first 12 months following admission? Date of first significant release is defined as date of placement on convalescent leave (indefinite leave), direct discharge or escape from which the patient does not return within 30 days, whichever comes first, or death in the hospital.

From the cohort studies in Ohio, which determine the status of the patient at stated intervals of time irrespective of his movement to and from the hospital during the intervals covered by the period of observation, one could answer these questions: What proportion of such admissions 1 year after admission and on subsequent anniversaries have been in the hospital continuously? What proportion are in any State mental hospital subsequent to release? What proportion are on leave? What proportion are discharged without subsequent return to a hospital? What proportion died in or out of a State mental hospital?

Routine Tabulations Desired

The committee recommended that, if more and more resources—personnel, time, and money—were to be put into cohort studies, the number of routine tabulations now requested from member States should be reduced. Certain routine tabulations would, of course, continue to be necessary for the State's own administrative use and for the institute to use in compiling its national summaries.

The committee recommended that only certain tables be prepared and submitted to the institute every year and that other tables be submitted once every 5 years, commencing with 1955. A total of 9 tables would be submitted annually.

On an annual basis, a member State will submit a financial statement and a statement of personnel for each of its State mental hospitals so as to provide the institute with data for comparing maintenance costs and personnel ratios in the model reporting area. In addition, States are to submit an annual tabulation on the movement of patient population, by sex.

Separate tabulations for males and females are to be submitted for the following tables, the first group on an annual basis, the second on a 5-year basis:

ANNUALLY

First admissions during the year by age at admission and by mental disorder.

Readmissions during the year by age at current admission and by mental disorder.

Resident patients at end of year by age at end of year and by mental disorder.

EVERY 5 YEARS

Discharges by net length of time in hospital and by mental disorder—first admissions.

Discharges by net length of time in hospital for current admission and by mental disorder—readmissions.

Deaths in hospital during the year by age at death, net length of stay for current admission, and selected mental disorder.

Deaths in hospital during the year by cause of death, age at death, and selected mental disorder.

Resident patients at end of year by age at end of year, time on books from date of admission, and selected mental disorder.

The report of the Cohort Study Committee was approved and accepted by the conference.

Statistics for Consumers

The Committee on Presentation of Lay Materials, another committee appointed at the 1954 conference, stressed the need for having the chief statistician in the State mental hospital system be responsible for the preparation of statistical materials from the point of collection through to the point of final presentation so as to assure valid interpretation. The statistician should not assume the role of a public relations expert. He should provide the basic statistical data needed to answer questions about various aspects of the mental health program and as much interpretative material as necessary to those persons preparing information materials for public consumption.

The committee specifically recommended:

That the National Institute of Mental Health give attention to the possibility of sponsoring in representative communities a number of surveys to obtain much needed data on the incidence and prevalence of mental illness and mental deficiency. Planning for needs and facilities makes it necessary that statistics be up to date, but the only data now available come from several outdated and noncomparable surveys.

That the institute require from each member State certain basic summary totals within 1 to 3 months after the end of the fiscal year in order to facilitate the prompt release of information to the press and national associations. The data of national interest would include total first admissions, readmissions, discharges, deaths, patients in residence and staff personnel at end of year, estimated per capita maintenance expenditures, and estimated financial expenditures. States not members of the area might also be interested in submitting such information.

That the institute consider the sponsoring of studies that would help in determining the most desirable methods of presenting statistical information. Two types were specified—those concerned with evaluating types of presentation in the field of mental hospital statistics and those concerned with determining which particular formats, layouts, and other pertinent aspects of the presentations attract the greatest audiences, are longest remembered, and assist in effecting action.

In the discussion that followed it was pointed out that several new studies are being carried out on prevalence and incidence of mental illness. Among these are the studies by Redlich in the New Haven area, by Rennie in New York City, and by the New York State Mental Hygiene Commission in Syracuse.

There is a body of knowledge available in the studies that the Public Health Education Branch of the Public Health Service has made on evaluating the effectiveness of various types of health education materials as well as in studies which advertising and psychological research personnel have made on presentation techniques. Copies of some of these studies would be made available to area States to see whether the general principles embodied therein are applicable to statistical presentation.

Discussion centered on the problem of how differences in administrative policies among the States, kind of patients admitted, types of facilities available, adequacies of staffs, and so forth, can affect the various indexes used in interstate comparisons of mental hospital accomplishments. Traditionally, in the tabulations published by the Bureau of the Census from 1923 to 1947 and continued by the National Institute of Mental Health since 1947, data for State mental hospitals have not been combined with data from county mental hospitals and from the receiving or psychopathic type of mental hospital because of lack of comparability. However, since changes in function have

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occurred in recent years so that some of these hospitals are now operating much the same as the State hospitals, the institute agreed to produce for 1954 and thereafter tabulations for public hospitals combining data for all of the institutions functioning in the same general way.

In discussing the difficulties of comparing improvement and release rates on an interstate basis, it was brought out that there may be considerable variation in the degree of psychiatric impairment at the time of admission as well as at time of release, and this, too, would affect interstate comparisons. A committee appointed to look into this problem will report to the 1956 conference.

The report of the Committee on Presentation of Lay Materials was approved and accepted by the conference.

Reporting Area Tabulations

The Biometrics Branch of the institute presented an analysis of tabulations based on 1953 material from eight member States. In view of some of the difficulties the staff had encountered in comparing this material, the need for the cohort type of analysis was again apparent, and the need for further information regarding administrative practices in the various States was pointed up. Perhaps some of the problems of noncomparability can be eliminated by selecting data pertaining to specific groups of patients rather than attempting to compare all patients in one State mental hospital system with all patients in another system.

Among the editing problems encountered by the biometrics staff working with the State tabulations were failure to convert the old diagnostic terms to the new psychiatric nomenclature, failure to give data in the age and diagnostic breakdowns requested, lack of correspondence between the time periods of the schedules submitted and the time periods specified on the instructions, and lack of agreement among the tabular totals for age, sex, or diagnosis, on the schedules submitted by a State. The need for greater care and accuracy in preparing schedules was stressed.

The Progress Reported

The States represented at the conference last year had indicated the need for certain statistical data on residents who were receiving inpatient care for mental illness under the auspices of the Veterans Administration. As a result the Veterans Administration, through the institute, has supplied the area States with needed and useful tabulations on patients resident in and discharged from VA hospitals. This information gives a more complete picture of the hospitalized mentally ill resident in a member State regardless of place of hospitalization. It was agreed that data on resident patients by claimed residence of the veteran would be the most useful material to be obtained on a yearly basis and that other data might be made available, as needed, at less regular intervals.

Delegates reported on developments and operating problems in their State statistical departments. Additional personnel, space, equipment, and duties have been added in some of the departments. The hospitals in one State now use mark-sense punchcards for routine reporting to the central statistical office, thus making it possible to gather more information per patient with less personnel. The statistical forms for hospital reporting in another State have been revised so that much information can be precoded, thus saving clerical time.

Illustrative of the view expressed at the conference that States have learned to work together for mutual benefit is the fact that since 1951 the model reporting area has grown from 11 to 17 States. Two States, Minnesota and Oklahoma, have joined the area since the 1954 meeting. Seven other States are in the process of developing their central reporting systems. Before too long, it can be expected that at least one-half of the 48 States will have satisfied the criteria for membership in the area.

Milk Sanitation Honor Roll for 1953–55

Fifty communities have been added to the Public Health Service milk sanitation "honor roll" and 71 communities on the previous list have been dropped. This revision covers the period from July 1, 1953, to June 30, 1955, and includes a total of 257 cities and 64 counties.

Communities on the "honor roll" have complied substantially with the various items of sanitation contained in the Milk Ordinance and Code recommended by the Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized and for those in which both raw milk and pasteurized milk is sold.

The recommended milk ordinance, on which the milk sanitation ratings are based, is now in effect through voluntary adoption in 419 counties and 1,594 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 11 States and the 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated in the recommended ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing was published in Public Health Reports, March 1955, pp. 337–340. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.

Although semiannual publication of the list is intended to encourage communities operating under the recommended ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

The rules for inclusion of a community on the "honor roll" are:

1. All ratings must be determined by the State milk sanitation authority in accordance with the Public Health Service rating method, which is based upon the grade A pasteurized milk and the grade A raw milk requirements of the Public Health Service milk ordinance. (A departure from the method described consists of computing the pasteurized milk rating by weighting the pasteurization plant rating twice that of the raw milk intended for pasteurization.)

2. No community will be included in the list unless both its pasteurized milk and its retail raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the retail raw milk rating is 90 percent or more.

3. The rating used will be the latest submitted to the Public Health Service, but no rating will be used which is more than 2 years old. (In order to promote continuous rigid enforcement rather than occasional "cleanup campaigns," it is suggested that when the rating of a community on the list falls below 90 percent, no resurvey be made for at least 6 months. This will result in the removal of the community from the subsequent semiannual list.)

4. No community will be included on the list whose milk supply is not under an established

program of official routine inspection and laboratory control provided by itself, the county, a milk control district, or the State. (In the absence of such an official program there can be no assurance that only milk from sources rating 90 percent or more will be used continuously.)

5. The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. (If the check rating is less than 90 percent, but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary period shows a rating of 90 percent or more. If the check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for 2 years from the date of the check survey, unless a subsequent rating during this period warrants its removal.)

Communities awarded milk sanitation ratings of 90 percent or more, July 1953–June 1955

100 PERCENT OF MARKET MILK PASTEURIZED

Community	Date of rating
Alabama	
Auburn	9–24–1953
Arkansas	
Fort Smith	8–26–1954
Colorado	
Boulder County	2–25–1955
Colorado Springs	1–20–1954
Denver	11– 3–1953
Grand Junction and Mesa County	4–15–1954
Las Animas-Huerfano Counties	3– 9–1954
Weld County	11–25–1953
District of Columbia	
Washington	3–15–1954
Florida	
Jacksonville	8–27–1954
Georgia	
Albany	12–16–1954
Athens-Clarke County	4– 8–1955
Atlanta	10–17–1953
Augusta-Richmond County	10–30–1953
Bainbridge	8– 6–1953
Cairo	2–25–1955
Calhoun, Gordon County	7–16–1954
Columbus	2–17–1955
Dublin	3–18–1955
Elberton	2– 9–1954
La Grange	7–15–1954
Savannah, Chatham County	8–12–1954
Statesboro	12– 3–1954
Swainsboro, Emanuel County	5– 5–1954
Georgia—Continued	
Valdosta	4–29–1954
Waycross	2– 4–1954
Idaho	
Jerome	11–24–1954
Moscow	9–1953
Indiana	
Bedford	8–30–1954
Bloomington	6–1954
Cooperative Grade A Milk Program	6–28–1954
Holland	
Huntingburg	
Jasper	
Tell City	
Crawfordsville	4–20–1955
Edinburg	12–1953
Elkhart	9–1954
Evansville	12– 3–1954
Franklin	12–1953
Greencastle	5–19–1954
Huntington	9–25–1953
Indianapolis	9–15–1954
La Fayette and West Lafayette	10–14–1954
Logansport	4– 9–1954
Madison	8–1954
Martinsville	11–20–1953
Mount Vernon	10–18–1954
Muncie	11–23–1954
Nappanee	11–1953
New Castle	11–1954
Shelbyville	9–1954
Terre Haute	2– 3–1955
Valparaiso	5–13–1954
Vincennes	3– 7–1955
Iowa	
Des Moines	8–12–1953
Dubuque	12– 2–1954
Sioux City	9–18–1953
Waterloo	10– 7–1953
Kentucky	
Bardstown	3–1955
Bowling Green	1– 7–1954
Brandenburg	8–12–1954
Campbellsville	4– 8–1955
Frankfort and Franklin County	7–23–1953
Fulton County	1–21–1954
Georgetown	10–16–1954
Hickman	1–20–1954
Hopkinsville	12–10–1953
Leitchfield	11–24–1954
Louisville and Jefferson County	4– 7–1954
Monticello	7–13–1954
Morgantown	1– 8–1954
Murray	4–29–1954
Newport and Campbell County	11– 3–1953
Owensboro	6–18–1954
Paducah and McCracken County	8–18–1953
Louisiana	
Calcasieu Parish	8–1954
Lincoln Parish	9–1954
Rapides Parish	5–1954
St. Martin Parish	7–1954
Vermilion Parish	9–1954
Mississippi	
Aberdeen	10– 7–1953
Amory	10– 7–1953
Boonesville	9– 9–1953

Communities awarded milk sanitation ratings of 90 percent or more, July 1953–June 1955—Con.

100 PERCENT OF MARKET MILK PASTEURIZED

Community	Date of rating
Mississippi—Continued	
Brookhaven	3– 4–1954
Clarksdale	10–13–1954
Columbus	3–26–1954
Greenville	9–14–1954
Greenwood	4–19–1954
Iuka	7– 9–1953
Louisville	9–16–1953
Macon	6–11–1954
Meadville	10–13–1954
Ruleville	4–22–1954
Vicksburg	7–10–1954
Winona	11–24–1953
Missouri	
Cape Girardeau	8–11–1954
Kansas City	9–13–1954
St. Joseph	7–16–1953
St. Louis	12–10–1953
Springfield	11–25–1954
Nevada	
Ely, McGill, and Ruth	4– 6–1954
North Carolina	
Avery County	1–15–1954
Beaufort County	3–31–1955
Bertie County	3–31–1955
Burke County	1–15–1954
Charlotte	1– 4–1954
Chatham County	4– 5–1955
Clay County	10–27–1953
Craven County	2–12–1954
Cumberland County	1–20–1954
Durham County	7–27–1954
Forsyth County	1–31–1955
Granville County	7–21–1953
Guilford County	6–28–1954
Henderson-Transylvania Counties	2–18–1954
Iredell County	11–17–1954
Lee County	4– 8–1955
Lenoir County	1– 7–1955
Mitchell County	10–23–1953
Nash County (excluding Rocky Mount)	9–17–1953
New Hanover County	5–28–1954
Northampton County	4–21–1954
Orange County	4– 5–1955
Person County	4– 5–1955
Richmond County	2– 2–1954
Rockingham-Caswell Counties	3–12–1954
Rocky Mount	9– 8–1953
Wilson County	9–18–1953
Oklahoma	
Ardmore	4–21–1954
Duncan	1–19–1954
Guthrie	5–25–1954
Mangum	11–18–1954
Okmulgee	10–13–1953
Seminole	10– 1–1954
Sulphur	2–17–1955
Tulsa	7–28–1954
Oregon	
Klamath Falls	5– 7–1954
South Dakota	
Aberdeen	8–28–1954
North Hills Unit	7–20–1953
Belle Fourche	
Deadwood	
Lead	
Spearfish	
Sturgis	
Sioux Falls	10–26–1954
Sisseton	8–24–1954
Tennessee	
Athens	8–10–1954
Bristol	11– 5–1953
Chattanooga	12– 3–1954
Clarksville	2–10–1955
Cleveland	10–13–1954
Clinton	4–21–1954
Columbia	5–19–1954
Covington	11–12–1954
Cowan	10–21–1954
Dandridge	11–10–1953
Decherd	10–21–1954
Dyersburg	10–29–1954
Franklin	5–20–1954
Gallatin	7– 8–1953
Gatlinburg	10–16–1954
Greenville	6– 5–1954
Humboldt	6–30–1954
Jefferson City	5–26–1954
Johnson City	9–23–1954
Kingsport	10– 8–1953
Knoxville	8– 6–1953
Lebanon	8–27–1954
Lewisburg	6–10–1954
Livingston	1–27–1954
Loudon	5– 6–1954
Manchester	10–21–1954
Maryville-Alcoa	11–23–1954
Memphis	3–25–1954
Milan	6–30–1954
Morristown	5–26–1954
Murfreesboro	7– 2–1953
Nashville and Davidson County	10–28–1953
Newbern	10–28–1954
Newport	10– 5–1954
Shelbyville	6– 9–1954
Sparta	5– 5–1954
Springfield	7– 6–1953
Sweetwater	10– 7–1954
Trenton	6–30–1954
Union City	8–12–1953
Winchester	10–21–1954
Texas	
Brownwood	7–16–1954
Bryan	8–30–1954
Cleburne	11–19–1954
Dallas	9–29–1954
Denison	6–24–1954
Falfurrias	1–21–1955
Galveston	7–24–1954
Harlingen	1–26–1955
Houston	5–28–1954
Huntsville	12– 3–1954
Jacksonville	12–11–1954
Kerrville	8–13–1954
Kilgore	7–14–1954
Lufkin	3– 3–1955
Midland	1–21–1955
Mineral Wells	12–14–1954
Nacogdoches	9– 3–1954
New Braunfels	9– 2–1954
Odessa	1–21–1955
Plainview	11– 2–1954
Port Arthur	6–29–1954
San Antonio	2– 8–1955
San Benito	1– 8–1955
Sweetwater	11–17–1954
Texarkana	4– 5–1955
Tyler	10–22–1954
Victoria	11–24–1954
Wichita Falls	3– 8–1955
Utah	
Ogden	11–10–1953
Salt Lake City	3–30–1954
Virginia	
Abingdon	11– 5–1953
Bristol	11– 5–1953

Communities awarded milk sanitation ratings of 90 percent or more, July 1953–June 1955—Con.

100 PERCENT OF MARKET MILK PASTEURIZED

Community	Date of rating
Virginia—Continued	
Buena Vista	8– 4–1953
Front Royal	8– 7–1953
Lexington	8– 4–1953
Luray	8– 7–1953
Marion	11–18–1953
Norfolk	5–18–1954
Portsmouth	5–18–1954
Richmond	4–16–1954
Roanoke	8–20–1954
South Boston	3– 8–1954
Staunton	6–25–1954
Suffolk	7– 1–1954
Waynesboro	6–25–1954
Williamsburg	10– 9–1953
Washington	
Bellingham	8–21–1953
Cowlitz County	7–30–1953
Washington—Continued	
Port Angeles	9–10–1953
Spokane	9–16–1954
Walla Walla	10–15–1953
Whitman County	10–14–1954
Wisconsin	
Green Bay	9–17–1953
Madison	10–26–1953

BOTH RAW AND PASTEURIZED MARKET MILK

Community and percent of milk pasteurized	Date of rating
Florida	
Escambia County, 99.6	6–30–1954
Manatee County, 99.57	8–21–1953
Georgia	
Carroll County, 97.5	3–24–1955
Cartersville, 97.7	1–26–1955
Cedartown, 97.7	11–19–1954
Gainesville-Hall County, 92.1	5–20–1955
Griffin, 98.2	9– 3–1954
Macon, 99.7	6–23–1955
Marietta, 96.2	5– 4–1954
Newnan, 92.8	7–23–1954
Thomaston, 87.4	6–17–1954
Toccoa-Stephens County, 88	4– 9–1954
Washington-Wilkes County, 99	9–24–1953
Winder-Barrow County, 98.5	3–10–1955
Idaho	
Twin Falls, 98.96	4–15–1954
Kentucky	
Henderson, 98.9	9–23–1954
Princeton, 96.2	5–19–1955
Somerset, 95	2– 7–1955
Missouri	
Moberly, 94.2	3– 1–1955
Montana	
Missoula, 99	11– 5–1954
North Carolina	
Davidson County, 96.4	7–28–1953
Haywood County, 95	11– 5–1953
Moore County, 93.6	3–12–1954
Robeson County, 96.8	1–11–1954
Vance County, 91.2	7–22–1953
Wilkes County, 91.9	9– 2–1953
Oklahoma	
Ada, 87	7– 8–1953
Elk City, 98.8	4–29–1954
Enid, 96.6	3–30–1954
Henryetta, 93	3–14–1955
Lawton, 99.2	12–27–1954
Muskogee, 99.6	1–21–1955
Norman, 99	1–27–1955
Oklahoma City, 97.7	11–12–1954
Ponca City, 92.6	2– 4–1954
Shawnee, 98.9	12–17–1953
Stillwater, 97	4–29–1954
Oregon	
Portland, 99.4	9–30–1954
Tennessee	
Harriman, 98	10–15–1953
Jackson, 98.6	11– 5–1953
Kingston, 96	10–14–1953
McMinnville, 90	5– 5–1954
Texas	
Abilene, 98.9	6–15–1954
Amarillo, 98	5–11–1954
Austin, 98.6	6–11–1954
Brady, 94	8– 7–1954
Childress, 83.4	4–22–1955
Fort Worth, 99.97	4–28–1954
Gainesville, 95	12– 1–1954
Gladewater, 98.8	7–14–1954
Longview, 99.6	7–14–1954
Lubbock, 99	8–20–1954
Marshall, 91	4–26–1954
Palestine, 95.1	6–15–1954
Paris, 94.8	12– 8–1954
Waco, 99	7–28–1954
Virginia	
Lynchburg, 98.8	12–1954
Washington	
Tacoma, 99.7	7–16–1954
West Virginia	
Kanawha County, 98	6–25–1954

NOTE: In these communities the pasteurized market milk shows a 90-percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90-percent or more compliance with the grade A raw milk requirements, of the Milk Ordinance and Code recommended by the Public Health Service.

Note particularly the percentage of the milk pasteurized in the various communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

public health pioneering

A Southern Heritage

APHA SOUTHERN BRANCH CONFERENCE REPORT

To commemorate a pioneering heritage and a history of progress, the Southern Branch of the American Public Health Association chose for its 23d annual meeting in New Orleans on May 11, 1955, the occasion of the 100th anniversary of the establishment of the Louisiana State Board of Health.

Several hundred delegates attended from Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, and nations to the south.

In a review of the southern heritage, Dr. Ben Freedman, director of the public health training center, Louisiana State Department of Health, pointed out that many health regulations were applied in the early Spanish settlements and that the Virginia, Maryland, and Carolina provinces pioneered with health measures under the British Crown. In the history of the United States, the people of the States now comprising the APHA Southern Branch appointed the first health officer, the first local board of health, and the first State board of health.

Other speakers pointed out that southern economic progress, handicapped for years not so much by climate itself as by diseases peculiar to a warm, humid climate, has been accelerated by control of such diseases. By such means, public health services have released southern energy and enterprise to break the vicious circle of illness that begets poverty that begets illness.

Seventeen of the papers read at the meeting are briefed here. Several others will be published in full at later dates.

The Past is Prologue—Theme of Address

brief My title comes naturally to one from a State facetiously referred to by us natives as "a vale of humility between two mountains of conceit." Our past achievements serve well only as they spur us to build even more soundly, never when they lull us into complacency.

Edwin A. Alderman, 50 years ago, set the goal of the south when he said that its supreme need is for trained men, men with prevision to see things before they happen, men who think with their brains and not their emotions, men who find out about things before settling them instead of settling them first and finding out about them afterward, men eager to build for the future rather than to chant the requiem of a past age.

It is definitely not disrespectful or ungrateful but actually necessary to orientation and alertness when we take frequent looks all around, including a quick glance backward, as we move forward. It is unfortunate that even a few health workers assume that the really important services in public health began the day he or she was hired. Since an appreciation of history tends to dispel such arrogance, we need more of such appreciation, and only then can we safely admit that we are doing more and better work than the early pioneers.

The Southern Branch of the American Public Health Association is entirely dependent on volunteer and drafted service for its activities and growth, and all have come through magnificently in spite of the many handicaps of heavy responsibilities in various types of jobs. In our large organization no one person could ruin it, but it takes devoted service from many to succeed day by day.

Our Southern Branch area has pioneered in environmental sanitation, control of intestinal parasites, State and local—and particularly rural—health department organization, immunizations, school health services, oral hygiene, control of insect pests in a subtropical area. All of these achievements have been under medical leadership. Some we did because we had to.

Our pleasantly warm climate, heavy rainfall, and soil types encourage outdoor living and certain disease hazards. The relative backwardness in and near the tropics has been due more to insect enemies than to climate. In the Tennessee Valley it was demonstrated that the former heavy morbidity and mortality from malaria around tropical and subtropical impoundments is controllable. The growth of tribes or towns and cities has been limited sharply to their ability and willingness safely to dispose of human wastes. As we in our lovely area bring insects and environmental pollution under effective control, progress will become limitless—agriculturally, industrially, and in human health and efficiency.

Private medical practitioners in our area have stimulated and promoted the development of sound local health departments. They have given of their time to serve on State and local health boards and to cooperate in case finding and other services. Private practice and public health have jointly brought communicable diseases under relative control.

We now have the organization, the experience in medical leadership, and cooperative teamwork to pioneer in the field of chronic disorders and accidents, and to prepare for providing public health services to our aging population.

To develop the ideal child, Socrates is said to have advised starting with the grandparents. For better control of chronic degenerative disorders, we should at least begin with sound parenthood, careful prenatal guidance, and early infant and preschool health protection and development.

As we set our sights on the future we can learn much from, and can deservedly be proud of, our pioneering past. Louisiana led the way with the first State board of health; Maryland with the Baltimore City Health Department; Virginia with her smaller type city health department, at Petersburg; Kentucky and North Carolina with early county health departments, in Jefferson and Guilford Counties; and North Carolina with the first strictly rural county health department, in Robeson. Alabama and South Carolina were among the first to attain full State coverage by local health departments—and we might go on. May we do our utmost to become worthy successors to our pioneer predecessors.

By J. W. R. Norton, M.D., M.P.H., secretary and State health officer, North Carolina State Board of Health, and president, 1954–55, of the Southern Branch of the American Public Health Association.

An Era of Responsibility Typifies Public Health

brief The era into which we are moving is still too confused to have a single adequate label. Depending on one's point of view, it can be described as the chemical era or the social era or the era of physics or radiological energy.

If we classify the present era as social or an era of social medicine, there is much to substantiate our case. The great variety of names dealing with mental health, the whole person, holistic medicine, and so on merely reflect the scope of the expanded interests which public health has developed.

Louisiana created early a unit of social work in its State health department. New York State now has an anthropologist on the staff of its health department. Departments of preventive medicine in the medical

By Roscoe P. Kandle, M.D., deputy commissioner, New York City Department of Health.

schools have anthropologists, sociologists, and medical and psychiatric social workers on their staffs doing research in social medicine.

The traditional separation of preventive and therapeutic services is slowly disappearing. Public health is concerning itself increasingly with both secondary and primary prevention of the chronic diseases. The State health department in Idaho has full responsibility for mental health. Public health nurses in Georgia have demonstrated their skill in helping families with post mental hospital experience. On the other hand there has been a further fractionation of many mental health services in many States.

In New York City 11 union-operated health centers provide high-grade diagnostic and ambulant therapy services and are quite successful in getting people to take advantage of periodic physical examinations. In Windsor, Ontario, the Ford Company and the union have negotiated a contract whereby all employees and their dependents will get prepaid hospitalization and complete medical care in the hospital, office, or home. The same care is assured after retirement.

The time has come when public health nursing care of the sick at home must be considered a normal part of the public health program. Visiting nurse associations and health department nursing staffs are uniting to form a single comprehensive nursing service. Certainly, a combined nursing agency can be a means to a better family service.

Family Health Center

The 3-year project now being conducted in Washington County and Hagerstown, Md., by Community Research Associates will give us a better perspective of the intricate complexities of family problems in this era of public health. The project combines research, demonstration, and direct service with the prevention and control of the heavy community burden presented by indigent disability.

During January 1954 about 13 percent of the families in Washington County received service from one of the community-supported agencies which deal with health, dependency, and maladjustment. About 6 percent of this group were designated "multiproblem" in that they were families with recognized problems, receiving care from agencies working in 2 or more of these 3 fields.

Studies elsewhere have shown a remarkable consistency of this 6 percent of multiproblem families—in getting service as they do from many agencies, in absorbing an enormous and disproportionate amount of community funds and professional staff time. In Washington County these multiproblem families comprise 88 percent of the public assistance caseload, 63 percent of the organized indigent medical care caseload, and 43 percent of the caseload of the agencies dealing with maladjustment.

To a high degree these community agencies—13 local voluntary, 18 local tax-supported, and 24 State—are treating the same families and individuals.

Washington County is in the process of attacking the basic behavioral, social, mental, and environmental problems presented by its problem families through a family health center and a unit of chronic disease control in which rehabilitation will have major emphasis. The center will unite the skills of medicine, public health, rehabilitation, public health nursing, family case work, and will integrate its mental hygiene service with that of the health department.

Ingenuity, Courage, Vision

A 5-year project with similar objectives is under way in Lafayette Parish, Louisiana. It is a remarkable project, stemming from the work of a State interdepartmental committee, which all agencies are pledged to work through. Each agency is to support its part of the plan within the framework of its responsibility to prevent the waste of human resources occurring from the social breakdown of families.

It should be clear to all of us that every health unit is carrying many of these multiproblem families. The children all too frequently repeat much of the pattern of asocial behavior and chronic illness of their parents. Even superficial reflection will impress us with the great amount of advice, pressure, needling, and direct action which these families receive from many workers, many agencies. Undoubtedly they get conflicting specific directions and counsel.

Few of us will have the opportunity to participate in trials such as those in Maryland and Louisiana, but everybody can take a crack at this tough basic problem. The logical approaches, in actual practice, are simple: recognition of multiproblem families as such, a comprehensive family diagnosis, comprehensive treatment based on this diagnosis, and the kind of leadership and machinery of synthesis necessary to make this treatment possible by a single plan. The difficulties lie in actually working out a way for functioning together to benefit our communities. When we have solved this problem by combining ingenuity, courage, and vision with hard work, we will have realized the most significant of the changing aspects of public health.

Local Agency Programs For Accident Prevention

brief Home and farm accidents have emerged as a leading threat to health and personal welfare in the United States in the second half of the 20th century. Home and farm accident deaths outrank all communicable disease deaths in most States. As a killer and crippler of children, home accidents outnumber the next five leading causes of death including motor vehicle accidents. The other large

By Charles M. Cameron, Jr., M.D., M.P.H., acting chief, accident prevention section of the North Carolina State Board of Health, and associate professor of public health administration at the University of North Carolina.

group experiencing unusual incidence of home accidents are the aged, and United States figures for 1953 show that 1 out of every 2 persons killed in home accidents was over 50 years of age.

Resistance to Program

In introducing the idea of home accident prevention to the local health departments of North Carolina, the State board of health's accident prevention section staff has found that the misgivings expressed by the local public health personnel fall into two general classes.

The first is the feeling that home accidents and other types of accidents do not actually constitute as real a health problem as do those conditions which can be related more closely to the traditional areas of medical and public health endeavor.

Accidents are, and should be, widely recognized as the concern of those engaged in the manufacture, maintenance, and operation of motor vehicles, the construction and use of highways and public roads, the operation of industrial plants, the conducting of occupational health and safety services, and those with interest in water safety, fire-arm safety, and the host of other safety specialty interests. The public health worker in some instances appears to feel that accidents to the individual in his home environment are not as worthy of the worker's time and attention as are the health problems related directly to bacterial etiology, degenerative conditions, clearly unhealthy physical and mental environment, and other conditions for which it is easier to demonstrate a cause and effect relationship.

The second area of misgiving is perhaps not so easily encompassed. It is expressed in the concern displayed by a number of health department staff members who believe that home accident prevention activities, to be effectually conducted, must be defined in concrete terms within the comprehension of all the staff.

This dubiety seemingly pertains not only to the etiology of accidents where terms such as "accident prone," "accident susceptible," and "accident liable," are hard to reduce to day-to-day fundamentals, but also to the methods of prevention. In the latter area, one frequently hears much about "education," "motivation," and "integration," and in some instances these terms seem peculiarly nebulous in the light of everyday health department operations.

The conceptions of accident prevention also are colored in many instances by the mass educational and promotional programs which have characterized the focus of over 90 percent of all safety programs in the United States in recent years. That home accident prevention involves more than the mobilization of press, radio, television, and other mass educational media has been hard for some public health administrators to grasp.

Health department reluctance to undertake home safety activities has stemmed from a failure to recognize the rising importance of accidents as a threat to health, a hesitancy to redraft program content to meet these new needs, and the difficulty public health safety leaders have experienced in demonstrating down-to-earth easily assimilated accident prevention techniques which can be adapted to existing health department programs.

Causes of Accidents

Home and farm accidents can be shown to result from a combination of two factors: human failing, such as physical, mental, or emotional conditions, and environmental hazards, either "built-in" the dwellings or "imported" by way of appliances and furnishings.

Physical conditions such as defective vision, loss of auditory acuity, dizziness, immaturity, feebleness, or other physical incapacity resulting from acute or chronic diseases or conditions easily can be pictured as causing many accidents, particularly among the elderly. That accidents can be ascribed to transient physical conditions such as fatigue, overindulgence, hunger, and sleepiness has been established.

The mental and emotional states which can be related to accidents are perhaps less well understood than the physical, but again certain examples can be elicited which can be applied readily to accidents or near-accidents within the experience of most health agency employees. These encompass the accidents which result from failure to exercise usually observed precautions due to anger, frustration, anxiety, depression, and preoccupation. These mental and emotional circumstances, existing almost wholly on the conscious level, can only serve to suggest the significance of less clearly defined influences operating within the subconscious. The etiological relationships concerned in accident proneness or susceptibility are within this less well-defined area. However, the existence of such individuals has been demonstrated in a variety of accident research studies.

It seems obvious, however, that home accident prevention programs need not be delayed until all facts pertaining to the so-called prone individual have been established fully.

Face-to-Face Education

Successful home accident prevention activities must combat both human failings and environmental hazards. The approach to the individual and to his home must progress simultaneously on a communitywide front and an individual basis. Health department opportunities for a combination of the face-to-face teaching of safety in association with the mobilization of community resources offer an approach to safety in the home unique in the history of the safety movement in the United States.

In attempting to gain the interest and cooperation of the family members to conduct effective education on home accident prevention, several channels are open to the health department. Certainly, the utilization of mass media, audiovisual aids, displays, posters, exhibits, contests, and other educational enterprises should not be overlooked for whatever value they may have. However, through public health nurses, sanitarians, and other field workers who daily enter hundreds of homes in the community, public health agencies are in a position to mobilize perhaps the most potent educational force yet

brought to bear upon the accident problem.

The public health worker has entree into the home where he or she is received as a family friend who can speak with authority on health matters. With each entry into the home, a situation for learning is created, and in no other setting could the teaching of home safety be more effective. Far-sighted public health authorities have been quick to recognize the implications for safety in almost all of the program areas where health departments are now active.

Maternal and infant supervision, geriatrics, nutrition, environmental sanitation, the hygiene of housing, mental health, insect and rodent control, radiological health, chronic disease control and many other activities have real concern for safety in one or more aspects.

Health workers sensitized to safety objectives and techniques have stated that usually it is not necessary to seek the opportunity to integrate home safety teaching into the home visit. Such opportunities frequently present themselves, and the worker need only be alert to develop the opportunities to their fullest potential.

In some areas, home visits by all disciplines have been used as an opportunity to gain valuable statistical information on family accident experience and to record hazards existing in the home. Such activities not only add to the epidemiological knowledge of home accidents, but also afford another opening for family education.

Group teaching has been demonstrated as a type of interpersonal relationship wherein valuable information may be imparted to all participants. Meetings of public health workers with mothers, parents, and other organized community groups afford an additional chance for home safety teaching to be achieved at its most receptive level.

Cooperating Groups

The health department launching safety activities will find a host of other official agencies and volunteer organizations and individuals with a related safety interest or activity. The department of motor vehicles, the public schools, the agriculture extension service, industrial commissions and labor groups, welfare departments, city planning and development organizations, housing authorities, and police and fire departments all have a vested interest in some phase of accident prevention. Coordinated planning and action with these official groups and the volunteer agencies can result in economy not only in funds but also in effort.

The precise depth and direction of the community centered safety program will depend in large measure upon the individual community's needs and resources. One single plan effective in all localities is beyond the realm of reasonable expectation. Important, however, is the thought that some organized plan must be formulated to involve actively all those concerned with the solution to this serious health problem.

Educating for Home Accident Prevention

brief The National Safety Council's "Accident Facts" informs us that the majority of persons over 65 who die as a result of home accidents are victims of falls. This information seemingly provides the key to the problem of preventing home accidents among the aged, for if we eliminate the causes of falls, it follows that we can cut the home accident death toll in half at one stroke.

A brief look at some of the causes of falls among the aged soon dispels any hope of easy victory, however, for these causes are both physical and environmental in nature. With advancing age, persons are less able to foresee and protect themselves from accident hazards, and accidents which may cause slight injury to the young very often result in serious injury and death when occurring in later life.

We know, too, that among the aged, feebleness, chronic disease, senility, or acute physical disorders are major contributors to accident incidence. Elderly people, especially those suffering chronic diseases, are affected by errors of judgment and personality changes. Coupled with malfunctioning joints, susceptibility to accidental injury is greatly magnified. Visual and auditory activity is also often diminished, increasing vulnerability to accidental injury.

In a 1954 survey of fatal home accidents in Maryland counties, senility and chronic disease or disability were listed as the most frequent physical factors contributing to accidental injury. Miscalculation, poor or faulty judgment, loss of balance, inability to avoid obstructions, stumbling over objects, unsteadiness, fainting, or just seeming to fall without reason were listed as primary causes of these accidents.

These findings take on new significance when we see that out of a total of 119 fatalities in the 65 and over age group, 91 fatal accidents occurred to persons more than 75 years old. The need for close and continued supervision is obvious.

Emphasis on Education

The most realistic approach to the problem of preventing home accidents among the aged is to determine ways of reducing exposure to unsafe conditions in their environment. Education, with emphasis on educating persons responsible for the care of elderly folk, is the best method. Engineering and enforcement are important to a lesser degree.

Prospective operators of facilities for the care of the aged often consult the health department before beginning to build or remodel. By offering suggestions which take legal standards into account and also reflect understanding of the needs and problems of both operator and patients, we can eliminate many hazards. A similar service to prospec-

By J. Charles Judge, chief, home accident prevention unit, Maryland State Department of Health.

tive builders of private residences might also be productive of goodwill and increased safety.

In these contacts and in our work with individual families we can suggest adapting home surroundings to the needs of elderly members of the family. Such relatively simple changes as arranging living quarters on one floor, providing a central place for personal belongings, keeping passageways clear and lighted at night will reduce exposure to falls hazards.

More difficult is interpretation to family and community of the emotional needs of the elderly. The older individual needs to feel that he is valued and loved and that he makes a useful contribution to family and community life.

In addition, there is urgent need for codes and regulations which assure the "building out" of safety hazards in the individual home or the institution.

In Maryland, the State board of health has vested responsibility for the licensing of hospitals, nursing, convalescent and care homes in the bureau of medical services and hospitals. The hospital licensing law establishes basic principles of hospital and nursing home construction and operation so as to assure safe and adequate care of patients in places other than their own homes or those of relatives.

The contribution of the health department sanitarian in promulgating and carrying out these regulations is of real value. The Maryland sanitarian inspects the hospital or home before the issuance of a license and annually thereafter on renewal.

Health Department Sanitarian

Much thought is being given to the part sanitarians might take in helping prevent home accidents aside from their institutional activities and general sanitation inspections.

Seagle has pointed out in the *South Carolina Sanitarian* that the sanitarian has good opportunity to observe hazardous conditions or unsafe actions on his daily rounds and that a program of inservice training and a checklist of home hazards would help prepare him to discuss unsafe conditions on the spot and make recommendations for practical means of correction.

What are some of the points which the sanitarian might keep in mind as he inspects private residences and nursing or care homes?

In connection with construction, he should determine whether electrical, plumbing, and heating installations have been inspected for compliance with local codes, manufacturers' specifications, and the minimum standards set by national boards.

He might call attention of the homeowner or nursing home operator to the need for elimination of dangerous changes in floor level, the need for sufficient electrical outlets to avoid overloading circuits and to eliminate long extension cords.

He might check switches and outlets to see that they are located at sufficient distance from sinks, showers, bath and laundry tubs and yet are accessible to the bedside, doors of entry and exit, and at the head and foot of stairs.

He might look for such booby traps in the environment as doors opening into stairwells, inadequate lighting of stairways and hallways, insecure or missing handrails, loose stair treads, risers that are not of uniform width or height.

He might recommend that scatter rugs be backed with a nonslip material or substance, that they not be placed at the head of stairs, and that flooring have a nonskid finish. He might recommend grab bars for tubs or showers. He might suggest a traffic plan to rid passages or walkways of obstruction.

In the handling and storage of medicine, the sanitarian might ascertain whether containers are clearly and properly labeled and whether medicine cabinets are located near running water to facilitate preparation of prescribed medicine. Are narcotics, sedatives, and other dangerous or habit-forming drugs in a safe place? Are medications no longer in use being promptly discarded?

In connection with fires, which next to falls lead in causing accidental death and extended morbidity, the health department sanitarian can augment the safety precautions required by the local fire authority or the State insurance commission. In many areas stoves and individual room heaters or space heaters are not acceptable and are a fire hazard. The sanitarian can work with county fire marshals who share our interest in saving lives.

Preventing accidents to the aged is not a task for one agency alone. Its solution will require the contribution of many—every member of the health department, engineers, architects, builders, teachers, individuals responsible for care of the aged, communities responding to the need for providing care facilities for their older citizens. Through such an approach it is reasonable to expect a steady reduction in the accidental injury and death rate among persons in the older age groups.

The Relation of Housing To Accident Incidence

brief In Augusta, Ga., a housing study was correlated with an accidental injury study to determine if the accident rate increases as housing standards become poorer.

The housing survey, made by the Richmond County Health Department in 1952 and 1953, classified the housing in two census tracts in the southeastern part of Augusta into five groups—A through E. Class A indicated the best housing and class E, the poorest. This section was selected for the survey because of the varied types of housing it contained. The class of housing was determined by inspection of the structure, dwellings within the structure, and the premises. The dwellings were graded by the penalty point method.

Also available was an up-to-date file the University Hospital of Au-

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gusta keeps on all accidents treated in the emergency room. Ninety-five percent of the emergency cases in the area are treated by this hospital.

For its analysis, the home safety unit of the Georgia Department of Health selected from the hospital data the accidents occurring in 1953 to the residents of the two surveyed census tracts, V and VI.

The total estimated population of the census tracts was 8,283—6,204 white and 2,079 nonwhite residents. An extremely high percentage of the nonwhite population lived in the lowest class of housing. Eighty-eight percent of all the persons living in class E housing were nonwhite; in class A housing, only 3 percent were nonwhite.

General Rate Upward

Home injuries treated in the hospital's emergency room were the leading type of injury. They almost doubled the rate for motor vehicle injuries—20.9 to 11.8 per 1,000 population.

Although the study found no clear-cut rise in injury rates as the housing, maintenance, occupancy, and dwelling scores decreased, the general rate trend was upward as the housing conditions became poorer.

The total treatment rate for all types of accidents increased steadily through the first four classes of housing—from 43.4 for class A to 76.1 for class D. But for class E housing the total rate showed a sudden drop to 55.5 per 1,000 population.

For home injuries, the rates by class of housing were: A—17.7; B—21.2; C—17.9; D—31; E—25.8. Thus, home accident rates dropped slightly for class C housing, turned back up sharply in class D, and dropped again in class E housing.

Two factors possibly responsible for the differences in injury rates, such as the drop in the rates for class E housing, are the large proportion of nonwhite persons living in class E housing and the lower socioeconomic status of residents in this class of housing. Possibly, they made less use of hospital facilities.

The rates by manner of injury showed the same general trend as in other comparisons, except for the categories "hit by person or objects" and "animals." These were considerably higher for class E housing. The category "falls," generally associated with poor housing, also showed a definite rise—from 8.4 per 1,000 for class A housing up to 17.2 per 1,000 for class E housing. This finding is another indication that there is possibly a relationship between housing and incidence of accidents.

Effect of Housekeeping

In another study, a sample survey of home injuries was conducted in Ware County, Ga. Data were collected on nonfatal injuries occurring in the 12 months preceding August 1954 according to: major causes of the injuries, by age, race, and sex; nature and manner of injury; and environmental and human factors associated with the accidents.

To discover if the type of housekeeping influences the home injury rate, the interviewers were asked to observe the condition of the housekeeping both on the inside and the outside of the house and to classify each according to one of five classifications: (1) very well kept, (2) well kept, (3) so-so, (4) carelessly kept, and (5) very carelessly kept. Although the recorded observations were strictly the opinions of the interviewers, the tabulated results did indicate a relationship between condition of housekeeping and home accident incidence.

For estimated major injuries outside the home, the rate per 1,000 population was lowest (26) for premises very well kept and highest (47.7) for premises classified as carelessly kept.

The rates for major injuries occurring inside homes rose in almost a straight line from 28.6 for very well kept homes to 40 for those carelessly kept.

The relationship was similar for minor injuries, although the estimated rates were somewhat higher. The inside and outside rates of 62.3 for homes very well kept rose to 100 for homes very carelessly kept inside and 87.7 for those very carelessly kept outside.

Aborigine Influence On the Southern Diet

brief Diet is an integral part of the culture of any people, and thus in the southern United States the dietary pattern is a part of our cultural heritage.

Generally, the southern diet is characterized by an excess of starchy foods; an ample supply of meat; a near absence of green, leafy vegetables; overcooking of all vegetables; frying in fats; and a general unvarying fare in season and out.

The food list is dominated largely by an Indian heritage. The diet of the indigenous Indians in the 16th century varied locally throughout the south but predominated in meat, corn dishes, beans, and perhaps squash.

The food preparation habits of the southerners are of mixed origin. The southern Indians were boilers and broilers, rarely bakers and never fryers. Long, slow boiling typified the preparation of plant foods other than maize. In fact, most tribes customarily kept a fairly large pot brewing and stewing at all times, and one dipped food from the pot when hungry. Only rarely were green, leafy vegetables used as salads.

On the other hand, frying is common throughout Africa, especially on the Guinea Coast and in the Congo Basin that contributed most of the American Negro slaves. In Colonial and pre-Civil War days, cooking was largely a function of the slave, and it is possible that various frying techniques would thus enter the cooking complex of the southerner. In addition, such cooking would soon attain a cultural value that would make it desirable to those who could not afford slaves.

Also in the Gulf Coast area large populations of West Mediterranean peoples, such as the French and

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Spanish, have introduced many dishes that involve frying in fats and oils. The American Indian had no domesticated animal comparable to the pig in the Mediterranean area and thus had no surplus fats to use as a food preparation agent.

No "Natural" Diet

There is nothing "natural" about the diet of man, and in the course of his development he has changed from a wholly herbivorous animal to an omnivorous one. He has developed various patterns of food habits that run from extremes of all meat to all vegetable. Like the American Indian, what he eats has been largely dictated by available foods and has often consisted of anything he could obtain. Only incidentally have man's dietary habits coincided with his basic needs.

Diet is often thought to be a matter of conscious selection, although certainly Lewin and Dickins have well supported the contention that "people like what they eat rather than eat what they like." Likewise, people often cannot eat what they do not like, and it is illusionary to think than man rationally selects his likes. The diet of several primitive peoples support this.

For example, nutritionists formerly thought that a balanced diet was virtually essential to existence, yet often Eskimos subsist their entire lives with not one item of vegetable food ever entering their diet. In fact, many Eskimos never eat anything in their lifetime that may be even remotely construed as vegetable food. Occasionally, a lucky hunter may be allowed to eat the stomach contents of a slaughtered whale or seal. In this "stomach spinach," as it has been called, he may get some partially digested vegetab.es. Certainly, there is nothing to suggest that a craving for vegetable food ever enters his head. On the other hand, it is certainly true that the Eskimo has a rather monotonous diet consisting of frozen fish, seal, walrus, or whale. This is seldom varied, and when something new enters the diet it is meat. It is not surprising that the Eskimo searches through the meat box in the house for a piece that is somewhat on the "high" side to vary this bland diet.

When an economic status supports the luxury of eating what one likes, man may be fairly selective, but at the subsistence level maintained by most primitives, one eats what is available. Australian natives eat vast quantities of the larvae of a certain moth that they eagerly seek each year. Several California tribes collect and store hundreds of bushels of acorns, and some inhabitants of Nevada and Utah spend nearly all of their waking hours collecting roots and tubers. Their habitat offers little else.

Some Asiatics exist almost wholly on a single plant—rice. In several spectacular instances, men have learned to use plants that are very poisonous in the unprepared state; yet these become a staple food. Manioc, or cassava, is such a plant—the most frequent food used by millions of Amazon peoples. In the fresh state, it is so charged with prussic acid that an unsuspecting bite into a tuber will puff up and blister the whole mouth, and to swallow a small portion usually is fatal.

Approach to Nutrition

Since diet is part of the culture of a people and one cannot change an aspect of culture very readily, a nutritionist should approach changes in the diet of a locality in a spirit of compromise.

Millions of people in China look upon milk with abhorrence, and most West Africans are horrified at the thought of eating fresh eggs. Many a northern visitor to the south finds eating grits incomprehensible as well as unpalatable, and simple lessons in home economics do not remove these taboos. Man rarely behaves in a rational manner, and the simple truth that one food is better for him than another is hardly sufficient. Deliberate educational approaches, such as inviting people to a prepared feast of nutria dishes, may have only slight success; perhaps nutria gumbo has a chance, whereas baked nutria may not—the former being more closely allied to existing practices.

In the Louisiana State University cafeterias, the nutritionists are constantly accused by the incoming students of failure to cook the vegetables. Hence, they now cook the vegetables to a cellulose pulp early in the academic year and gradually adjust the cooking time so that by spring the vegetables are properly prepared. This gradualism in vegetable cooking certainly pays bigger dividends than if the student is confronted with strange, but properly cooked, vegetables from the start.

Finally, a wholly humanistic approach is demanded. If the nutritionist presents a too-professional, oversophisticated front, the recipient of the instruction is likely to be repelled. A home economics teacher or a county demonstrator does not have the status that the local physician may have. A physician may accomplish some things simply by prestige. Dickins has shown that most new recipes were introduced to southerners by their friends, and this entree should be exploited by cultural participation on the part of the home economists.

Perhaps an anthropologist, untutored in the culinary skills and lost in the sea of nutritional data, is presumptuous in offering suggestions to the professional food preparer. Nonetheless, this paper is a success if it offers only "food for thought."

Leptospirosis Diagnosis In North Carolina

brief In order to carry out epidemiological investigations of leptospirosis, it is our conviction that the State public health laboratory must provide a reliable diagnostic test for this disease. This

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service was initiated in the North Carolina State Laboratory of Hygiene in January 1954.

The need for the service was brought to a focus in North Carolina in late 1953. At that time, blood specimens were being sent to the Public Health Service Communicable Disease Center in Chamblee, Ga., and reports were often delayed from 1 to 3 months because of the great demand from all sections of the country for the service. For example, the report on a specimen found to be positive in a high titer was not received, it was learned on investigation of the case, until several weeks after the patient had been discharged. The patient had been seriously ill with a jaundicelike disease believed to be infectious hepatitis, although leptospirosis had been considered in the differential diagnosis. A visit to the patient's home after receipt of the laboratory report elicited the information that he had cared for several bird dog puppies when they were ill with leptospirosis.

The response from physicians and veterinarians to the initiation of the diagnostic service has been gratifying, although many physicians do not yet recognize leptospirosis as a disease entity prevalent in North Carolina. The most important reasons for this are: (1) the limitation of instruction on leptospirosis in medical schools to the classical Weil's disease; (2) the widespread publicity given to the viral type of infectious hepatitis; (3) the so-called catarrhal jaundice known for generations to be associated with mild colds and influenza; and (4) inadequate diagnostic service before 1954.

Two points should be kept in mind in dealing with leptospirosis: (1) There are specific laboratory tests for this disease (although a real need for improvement exists), and (2) the reservoir for *Leptospira* organisms is in the lower animal kingdom. Therefore, control of leptospirosis requires the combined efforts of the physician, laboratorian, veterinarian, and health officer. Any member of this team may find the first clue. The others complete and confirm the diagnosis, treat the patient, and carry out epidemiological studies directed toward finding the source of infection and initiating control measures.

Diagnostic Tests

The most specific test for leptospirosis is isolation of the organism, but most laboratories are not equipped to carry out this procedure routinely. The detection of specific antibodies in the serum of ill or convalescent patients, however, is a procedure that can be done by public health laboratories. Because the complement fixation test is not yet standardized, the agglutination-lysis test or the agglutination test with killed antigen is used.

For the agglutination test, two specimens of clotted blood, collected about 10 days apart, are required. A rise in titer of agglutinins is considered a reliable basis for a diagnosis of leptospirosis. However, with samples taken late in the disease, when the patient is finally jaundiced or is making a slow recovery from an illness thought to be infectious hepatitis without jaundice, the titer will not rise and may even come down. Since native antibodies do not appear in the normal person, the presence of antibodies indicates present or previous infection with leptospirae.

The difficulties encountered in providing a diagnostic test for leptospirosis make it a task for experienced bacteriologists only. Temperature requirements for growing the organisms are strict. The organisms may disintegrate spontaneously and without warning. Since maximum growth takes place in 5 days, multiple cultures must be maintained if a source of supply for antigens is to be available, the choice of cultures depending on the types of infection in the locality. Antigens must be prepared regularly, and the tests must be carefully controlled to insure good results.

Examples of Cases Diagnosed

A high percentage of the human and animal serum specimens examined in North Carolina since January 1954 were positive. Many specimens were positive with more than one strain of *Leptospira*, indicating cross-agglutination between strains. A few examples follow:

Specimens from several herds of cattle which were experiencing breeding difficulties, including abortion, and which were negative to *Brucella* tests were positive in high titers to *Leptospira pomona*.

A few mule blood specimens have been found positive to *Lept. pomona*. One specimen that reacted in a very high titer was taken from a mule suffering from periodic iridocyclitis, a condition recently recognized as a delayed and uncommon sequela of leptospiral infection in men and horses.

Among the specimens from humans was one which showed a titer of 1:2,048 for *Lept. pomona*. It was taken from an 8-year-old Negro boy with an illness diagnosed by his family physician as leptospirosis. An epidemiological investigation revealed that the boy had had no contact with animals suspected of having the disease. However, a goat was kept on the farm premises where the boy lived, and rats were prevalent. Drinking water was obtained from a shallow well that could easily be contaminated with goat urine. A blood specimen from the goat showed a titer of 1:2,560 for *Lept. pomona*. Later, the goat was killed and *Lept. pomona* organisms were isolated.

Rabies Control Plan For South Carolina

brief In September 1950, a statewide survey was made in South Carolina in an attempt to determine the extent of rabies within the State. Between September 1950

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and March 1951, after numerous consultations with veterinarians, county health officers, and county health sanitarians, the South Carolina State Board of Health drew up a master rabies control plan.

The first step in the plan was a statewide publicity campaign, which was conducted for 30 days prior to a designated period of animal vaccination and stray dog control. The radio, daily and weekly news releases, and pamphlets distributed through schools, churches, and civic organizations were used in the campaign.

The second step was the operation of vaccination clinics for a 6-day period, in April 1951. The clinics, a total of 1,042 of them, were manned by county health department personnel and members of civic groups, the boy and girl scouts, and similar organizations. Practicing veterinarians performed the vaccinations. Vaccine and tags were furnished by the local veterinarians, who collected $1.00 per animal. State rabies certificates were furnished each veterinarian by the State board of health. During this period, 57,739 dogs were vaccinated.

The third step was a followup publicity campaign to further educate the public regarding rabies and its control. Stray dog control and the reporting of rabies cases were stressed. The public was kept rabies conscious throughout the year and was continually requested to take pets to the local veterinarian for vaccination.

The rabies control plan, with a few minor changes, was carried out again in 1952, 1953, and 1954. The results of the program from 1950 through 1954 are shown in the accompanying table.

Morbidity Reporting

In August 1951, a morbidity reporting system for rabies was initiated by the State board of health, the reports originating with the practicing veterinarians and routed direct to the vital statistics section of the State board of health. The percentages of cards returned were as follows: 1951, 98.7 percent; 1952, 83 percent; 1953, 78.3 percent; 1954, 67.4 percent.

In 1953, the State board of health received complete investigation reports on 631 persons who were given rabies treatment. Of the 373 animals involved, 319 of them were dogs, showing definitely that dogs constitute the major rabies problem as far as human beings are concerned. Of the 631 persons, 539 were white and 37 were Negro, a finding which suggests that Negroes in the State do not report possible exposure to rabies unless the exposure is a severe bite.

The investigation reports revealed, further, that puncture wounds caused by teeth was the method of exposure for 281 of the persons treated. Wounds caused by scratches was reported for 125; and handling of animals, for 162. For 56 of the persons treated, there was no exposure, and for 7 the method of exposure was not stated. From these data, it would seem that 350 persons were treated for rabies when exposure to the disease was doubtful. We believe that a more extensive history of the case should be obtained before humans are given rabies treatment.

Rabies control data for South Carolina, 1950–54

Year	Vaccinated, all species	Clinical cases	Positive heads	Human treatments
1950	55, 629	885	324	3, 362
1951	126, 447	686	350	2, 973
1952	108, 939	372	298	2, 213
1953	100, 622	279	246	1, 946
1954	98, 418	188	293	1, 917

Matched Data on Births And Neonatal Deaths

brief With the introduction of the birth weight item on the birth certificates of all but one State by 1950, it became possible to obtain much needed information on the incidence of prematurity and mortality among prematures for the general birth population. Data on incidence of births by weight are now being tabulated regularly by the National Office of Vital Statistics and by many States. A special NOVS study covering births in the first 3 months of 1950 will provide detailed national and regional data on mortality by birth weight. The NOVS can make studies of this type only occasionally and will require the assistance of the States in the matching phase of the operation.

Many States match births and infant deaths routinely, and data on mortality by weight can be obtained as a byproduct. Information for individual States is of interest to many people because public health programs for the special care of prematurely born infants are now operating in several States. To make State data available in one source, the Public Health Conference on Records and Statistics—a permanent organization providing for coordination among Federal, State, and city registration executives and vital statisticians—sponsored a cooperative program to send data on matched births and neonatal deaths to the NOVS for processing and publication. This program was initiated with the collection of data for 1950.

Specifications for the tabulations to be collected from the States were worked out jointly by the NOVS and the States through the mechanism of the conference. Table forms prepared by the national office are sent to the participating States. In the

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first 2 years of the program detailed data were collected on birth weight by race, sex, attendant at birth, period of gestation, plurality of birth, cause of death, and age at death. At the last conference meeting, it was agreed to continue collecting data on an annual basis but to schedule detailed tabulations only cyclically. Thus, for 1952–54 the data have been or will be requested by race, period of gestation, and birth weight; for 1955–57, it is planned again to obtain tabulations by cause of death and age at death.

Participation in the program has increased markedly. In 1950, 11 areas (including 1 city and a Territory) and in 1951, 19 areas (including 2 cities, 1 Territory, 1 possession) submitted tabulations; and about 25 areas are expected to participate in 1952 and 1953 (see table).

Participants in the collection of data on matched births and neonatal deaths

Area	1950	1951	Tentative	
			1952	1953
Total	11	19	24	28
Arkansas			x	x
Connecticut		x	x	x
Delaware	x			
Florida		x		x
Georgia			x	x
Illinois	x	x	x	x
Iowa			x	x
Kansas				x
Kentucky	x	x	x	x
Maryland			x	x
Michigan		x		x
Minnesota		x	x	x
Mississippi	x	x	x	
Montana			x	x
New Hampshire	x	x	x	x
New Mexico	x		x	x
New York State (excl. New York City)	x	x	x	x
North Carolina			x	x
Ohio		x		
Oklahoma		x		
Oregon		x	x	x
Rhode Island			x	x
Tennessee	x	x	x	x
Utah			x	x
Vermont		x		x
Virginia				x
Wisconsin	x	x	x	x
Baltimore	x	x	x	x
New York City		x	x	x
Alaska			x	x
Hawaii	x	x	x	x
Virgin Islands		x	x	x

In formulating the program, only general principles for tabulating the data were set down. These principles were:

1. Neonatal death records included in the tabulations for an area should relate to all infants born in that area.

2. Tabulations on neonatal deaths prepared on the basis of year of birth are preferable to those based on year of death. However, this is not an important issue and tabulations prepared on either basis should be accepted.

3. Unmatched neonatal deaths should be tabulated along with matched neonatal deaths.

Answers to inquiries on the data submitted for 1950 and 1951 indicated in what ways the States departed from these principles. The only significant difference was the omission of unmatched neonatal deaths.

Information was not requested of the States on other procedures related to the coding and tabulating of the data. The consequent inability to evaluate the comparability of the data creates one of the main problems in the use of pretabulated data. In 1950 and 1951, birth data tabulated by the NOVS were used in conjunction with mortality data prepared in the States for computing mortality rates. The decision not to request the birth data from the States in these years was made in the belief that the burden of tabulating might act as a deterrent to the participation of some States. Experience with the use of data from the States and the NOVS for 1950 showed inconsistencies in the coding of certain items. Another problem which arose in 1951 was related to the 50-percent sampling of birth data for that year. This was of significance at the very low weights. Beginning with 1952, the States have been requested to supply birth data if available, as well as mortality data. Most States have indicated this could be done.

A report on data collected for 1950 and 1951 will be published later this year. This report will contain birth weight statistics for births by race, sex, and plurality and for neonatal deaths by race, sex, cause of death, and age at death. Data on a few additional items on which statistics were collected were not included because of the apparent lack of comparability of the birth and death data for some areas. Subsidiary information for each area on completeness of birth registration and mortality based on data tabulated wholly by the NOVS is to be shown. Because of the biases in the reporting of weight for very small infants who die soon after birth, special procedures, utilizing available data on gestation age, were set up for the

distribution of births and deaths with weight not reported for each area. Only these adjusted data are shown in the report.

The punchcard program started a few years ago has some significance for the collection of pretabulated data on matched births and deaths. Under this program, States are now furnishing the NOVS with punchcards used in national tabulations. This method of collecting data has been limited principally to birth statistics. Through copies of birth certificates received from these States and sample verification of the punchcards, the consistency of these data is checked continuously. Several States are now participating in the punchcard program. Pretabulated birth weight data received from these States should generally have good comparability. However, until now, some of the States in the punchcard program have not been able to supply data on matched births and neonatal deaths. In the future development of the program, it would be of especial value to obtain the participation of these States because of the assurance of greater consistency in their data.

At regular intervals in the future—perhaps every 5 years—the NOVS hopes to carry out special studies to make available statistics on weight-specific mortality. Data should be available for each State.

Progress in Prevention Of Diarrheal Diseases

brief Although acute diarrheal diseases have been brought under control in the United States, Canada, and a limited number of other economically favored countries, available mortality data clearly indicate that the prevention of these diseases must be acknowledged as a major current public health problem in most of the countries of Latin America.

By Albert V. Hardy, M.D., Dr.P.H., director of laboratories, Florida State Board of Health.

It is of historic significance that these diseases are at last to receive concentrated specific attention from organized international public health. Within one decade there may be attained in the countries of the Americas that progress in the control of diarrheal diseases which in the United States came slowly over a period of 50 years.

Multiple Factors in Prevention

There is no clear evidence as to what preventive measures were effective in the United States. There was no vaccine, no new medication. There was no biologic vector to be eradicated by an intensive program.

Multiple factors apparently were involved. Perhaps of chief importance were the safer disposal of human feces, better personal cleanliness, the control of flies, and marked improvement of infant hygiene in the home.

These changes were brought about by community, social and industrial development, as much as by direct public health activities. The introduction of the motor car, for example, with the disappearance of stables in urban centers and the elimination of this prolific source of fly breeding presumably contributed to the control of diarrheal diseases.

Data now available indicate that the serious diarrheal diseases of infants and children are chiefly specific enteric infections. Shigellae are the major etiological agents. Salmonellae are of lesser importance, though the infections caused by these organisms have been reported to be prevalent in some rural areas where animals and humans live in close proximity. Other infectious agents such as *Entamoeba histolytica* and specific types of *Escherichia coli* are probably of limited quantitative importance as a leading cause of death.

The role of viruses has not been established. The important role of predisposing causes, and particularly of deficiencies in nutrition, is generally acknowledged even though the specific factors responsible for diarrhea have not been fully defined.

Epidemiological studies have led to the conclusion that the dissemination of shigellosis commonly involves a more or less direct transfer from one person to another of human feces containing shigella, and the role of flies in this transfer has been securely established. In salmonellosis most of the infections have their origin in lower animals and fowl, and dissemination occurs predominantly through the medium of foods.

New Advances in Control

Present techniques have markedly increased the sensitivity of bacteriological tests for shigella and salmonella and have made it practicable to handle relatively large numbers of these diagnostic examinations. Bacteriological tests on representative samples of the normal population have established the common occurrence of carriers of shigella. They have served also to reveal the broad range of clinical manifestations of shigellosis and the frequent occurrence of clinically mild cases in adults. These observations must be considered in planning for effective control.

Therapeutic knowledge is now adequate for the prevention of deaths in almost all cases of diarrheal disease. Regardless of etiology, prompt and adequate fluid and electrolyte replacement therapy commonly is successful.

In antibacterial treatment, the sulfonamides and many of the antibiotics have been found to be rapidly effective in shigellosis although specific therapy has little or no value in salmonellosis. These advances in treatment provide a means for the successful therapeutic management of a very high percentage of all cases of diarrheal disease provided treatment is begun without delay.

International Focus

The chief responsibility for the prevention of diarrheal diseases must rest with organized public health. There is the evidence of history that the severe diarrheal diseases are almost totally preventable. There is no single point of attack. For their prevention, mul-

tiple procedures are indicated, and a well-balanced program is necessary.

The nature of the problem must be accurately diagnosed—this requires the participation of the public health laboratory, epidemiology, and vital statistics.

Environmental preventive measures must be applied through programs of community sanitation, with emphasis on the availability of water, the safe disposal of human feces, garbage disposal, and fly control—this calls for the services of sanitary engineers and sanitarians.

Knowledge must also be applied directly to individuals—this is the responsibility of public health physicians, public health nurses, and health educators.

All these broad control measures must be organized and coordinated by the public health administrator. These goals will not be attained easily, but it has been adequately established that difficult public health programs can be carried out when they are given due emphasis.

Heretofore, major attention by international health agencies has been directed toward such diseases as yellow fever, malaria, typhus, and yaws, and only scant attention has been given to the diarrheal diseases, recognized as an even greater cause of death than malaria, for instance.

In view of this history the recent activities of the 14th Pan American Sanitary Conference at Santiago in October 1954 are highly significant. During 5 half-day sessions representatives from all of the countries of the Americas considered together problems in the control of the diarrheal diseases. By resolution the Pan American Sanitary Bureau was requested to implement the technical recommendations which grew out of the technical discussions.

From that point the matter is being carried forward by critical planning. A series of international regional seminars will give attention to the newer scientific advances in the knowledge of the diarrheal diseases. A demonstration area to apply and evaluate a broad preventive program is deemed essential. As an immediate life-saving program, the easily applicable measures to prevent dehydration and resulting death will be promoted widely.

The effectiveness of these and other procedures can be measured only by time, but it may be anticipated that there will be an increased emphasis on the control of diarrheal diseases at national and local levels in our sister countries.

Prematurity Program In North Carolina

brief Premature birth is the greatest single factor associated with the deaths of infants in North Carolina as well as in the United States.

The reduction of infant deaths in the first 28 days of life has not kept pace with the decline in mortality in the later infancy period, 1 month to 1 year. Approximately 60 percent of the infants who die in the first month are premature—that is, they weigh 5½ pounds (2,500 grams) or less at birth.

If progress in the lowering of infant mortality is to continue, steps must be taken to reduce the number of deaths among prematurely born infants. To this end, a premature infant care program was established in North Carolina in July 1948. The program, sponsored by the North Carolina State Board of Health, the North Carolina Pediatric Society, and the Children's Bureau, is designed to reduce the infant mortality rate in the State through:

1. Prevention of premature labor by the methods known to prolong gestation.

2. Care of the premature infant by lessening risk of delivery, early case finding, hospitalization in approved centers, and followup.

3. Education of nurses, physicians, and the laity in the care of premature infants.

In 1952 a special report form was initiated for collecting detailed information on each premature infant born in the six participating hospitals or referred to them for care. This form calls for information on prenatal care of the mother, previous pregnancies, complications of pregnancy, type of delivery, and use of anesthesia and analgesia. Information on treatment and progress is requested for infants whose care is paid for by the State.

These records, along with consolidated birth and matching mortality data kept since 1952 on a statewide basis supplied the information for analyzing the effect of the program.

During the study period 1952–53, there were 16,378 single premature births in North Carolina; 1,307 of these births occurring in the six participating hospitals are compared with the 15,071 births in other places.

Analysis showed that a significantly larger proportion of the premature infants in the lower weight groups, 2,000 grams or less, were born in the premature centers—38 percent compared with 31 percent.

The greatest weight difference was found for nonwhite infants in the previable group of under 1,000 grams. The percentage of babies (9.1) in this group in the premature centers was almost twice the corresponding percentage (4.6) for all other nonwhite prematures.

Because of a higher proportion of early premature babies and the referral of obstetric problem cases, the centers had a higher neonatal mortality rate—156.8 per 1,000 live births compared with 146.7 for all other prematures. Actually, with the exception of the lowest weight group, the weight-specific mortality rates in the premature centers were much lower than for other premature births.

Immaturity, unqualified or subsidiary to other conditions, was the most important cause of death for both groups of prematures—80.3 per 1,000 live births in the centers compared with 71.3 for all other births. For nonwhite births the difference

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was more striking—105.3 per 1,000 live births in the centers compared to 75.1 for all other nonwhite prematures. These differences in mortality rate might be accounted for again by the difference in the weight distribution. With a large proportion of early prematures in the centers one might expect a larger proportion of deaths due to immaturity.

Death rates due to asphyxia and atelectasis for white babies and birth injury for nonwhite babies were considerably higher among premature center births.

Maternal Factors

Analysis of maternal factors related to prematurity revealed that type of delivery, use of anesthesia and analgesia, and complications of pregnancy are closely related to the survival of the premature infant.

Type of care received by the mother was reported for all but 10 of the 1,307 premature births in the hospitals. Of these 29.4 percent received clinic care, 68.3 percent private care, and only 2.3 percent no care.

The type of delivery—normal, abnormal, instrument, cesarean, and unknown—was stated for all but three births. For 66 percent of the cases the delivery was normal, presumably without operative interference. Another 21.1 percent were delivered by instrument—low, mid, or high forceps.

Mortality rates were highest for babies with an abnormal presentation delivery and those delivered by cesarean section—333.3 per 1,000 live births for abnormal and 246.4 for cesarean. However, each of these rates is based on less than 100 cases and is subject to great variability.

Anesthesias used were classified according to three types: general, local, and spinal or caudal. The analgesias administered were barbiturates, demerol, scopolamine, or other specified analgesia.

It is known that both an anesthesia and an analgesia were given for 60.5 percent of the deliveries. In 63.4 percent of these cases a general anesthesia was given, and demerol was the most frequently used companion analgesia.

In comparing the causes of death and various types of anesthesia administered, it was found that for deaths due to asphyxia and atelectasis the mortality rates were highest for births in which either caudal or general anesthesia was used at delivery. Among deaths due to immaturity, the group of births experiencing the highest mortality rate had been administered no anesthesia. The rate for this group was 278.1 per 1,000 live births.

Complications Affect Survival

The following classes of complications were arbitrarily set up on the report form: toxemia—mild, severe, and eclampsia; hemorrhage; infection tuberculosis, syphilis, and german measles; premature rupture of membrane 24 hours prior to delivery; and other specified complications.

Of the 1,307 premature infants 41 percent were born to mothers with complications of pregnancy. Also 52 percent of the 205 neonatal deaths occurred among the births to mothers with complications.

The mortality rate for this group was 198.5 per 1,000 live births while that for babies born to mothers without complications was 128.1. The difference between these two rates is statistically significant. Deliveries

Single premature live births and neonatal deaths according to birth weight, North Carolina (exclusive of premature centers) and premature centers, 1952 and 1953

Birth weight (in grams)	Live births						Neonatal deaths					
	Number			Percent			Number			Rate [1]		
	Total	White	Nonwhite	Total	White	Nonwhite	Total	White	Nonwhite	Total	White	Nonwhite
North Carolina												
Total	15,071	8,786	6,285	100.0	100.0	100.0	2,211	1,296	915	146.7	147.5	145.6
Under 1,000	758	467	291	5.0	5.3	4.6	561	361	200	740.1	773.0	687.3
1,001–1,500	1,284	719	565	8.5	8.2	9.0	609	364	245	474.3	506.3	433.6
1,501–2,000	2,636	1,513	1,123	17.5	17.2	17.9	506	284	222	192.0	187.7	197.7
2,001–2,500	10,393	6,087	4,306	69.0	69.3	68.5	535	287	248	51.5	47.1	57.6
Premature centers												
Total	1,307	1,022	285	100.0	100.0	100.0	205	157	48	156.8	153.6	168.4
Under 1,000	100	74	26	7.6	7.2	9.1	82	57	25	820.0	770.3	961.5
1,001–1,500	132	106	26	10.1	10.4	9.1	51	38	13	386.4	358.5	500.0
1,501–2,000	261	206	55	20.0	20.2	19.3	39	33	6	149.4	160.2	109.1
2,001–2,500	814	636	178	62.3	62.2	62.5	33	29	4	40.5	45.6	22.5

[1] Rate per 1,000 live births.

complicated by hemorrhage exhibited the highest mortality rate.

Infants born to mothers with complications comprise about 60 percent of the weight group of 2,000 grams or less. In the lowest weight group, under 1,000 grams, 63 percent of the births were to mothers with complications. The risk of a previable or early premature baby was greatest for the mother with a complicated pregnancy.

Further study will be necessary to determine the relationship of certain maternal factors to prematurity and survival. Data presently available are insufficient for any definite conclusions to be drawn, and 1954 and then 1955 data will offer additional evidence. However, we are confident that many premature babies that would have died have been saved as a result of this program.

Congenital Disorders—A Problem for Research

brief Events of the past two decades present public health statisticians with an opportunity to help solve the problems of congenital malformation, cerebral palsy, epilepsy, and mental deficiency. These disorders have perplexed both professional and lay thinkers throughout the period of recorded medical history.

The occurrence of malformation at birth has commonly been thought to be the result of some defect in the germ plasm and thus hereditary. Recent clinical observations and experimental demonstration in animals indicate, however, that the hereditary hypothesis is not a sufficient explanation of these disorders, and the concept of environmental determination has evolved. If proved true as a general mechanism, this concept provides great hope for the prevention of these tragic abnormalities.

There is a pressing need for extensive statistical research to examine a set of hypotheses which are consistent with the concept of environmental determination. Since the public health statistician already has, by his custody of vital records, possession of much of the information required for this task, he stands in a particularly fortunate position to produce useful information.

By Matthew Tayback, Sc.D., director of the statistical section, Baltimore City Health Department.

Hypotheses To Be Tested

The principal questions that need clarification are:

1. Does the presence of infection during pregnancy affect the risk of congenital anomaly? Two further questions apply here: (*a*) Do all diseases exhibit teratogenic properties or only specified types? (*b*) Is the time of onset a determinant of the teratogenic potential of a disease?

2. Does the presence of noninfectious disease—toxemia, hypertension, anemia, diabetes—affect the risk of congenital anomaly? (Questions 1–a and 1–b also apply here.)

3. Does the presence of nonspecific insults—vaginal bleeding, accidental injury to mother, dystocia, malpresentation—affect the risk of congenital anomaly? (Question 1–b, when applicable.)

4. Do cultural and socioeconomic variables directly affect the risk of congenital anomaly?

5. Is the increased risk of mongolism and gross malformation in babies born to older mothers independent of cause-effect mechanisms under investigation as outlined in questions 1, 2, and 3?

Information Required

The basic data required to compose a meaningful and useful body of knowledge on congenital disorders may be listed as follows:

1. Frequency of malformation, total and by type, among stillbirths and live births.

2. Time trends in the incidence data, by year and by season.

3. Geographic variation in incidence by type of malformation.

4. Variation in incidence by socioeconomic status, age of parents, and birth order.

5. Presence of infectious disease, by type and by date of onset during pregnancy for each live birth and each stillbirth.

6. Presence of specified complications of pregnancy for each live birth and each stillbirth, with specific reference to anemia, hemorrhage, and toxemia.

7. Presence of specified complications of labor for each live birth and each stillbirth with specific reference to malpresentation, placental abnormality, and dystocia.

8. Presence of symptoms of respiratory difficulty in the infant at birth.

Sources of Data

The public health statistician has an instrument in the form of vital records which is clearly without equal for establishing the characteristics of the study universe. There is little question that birth records can provide useful working information on distribution of infants at risk according to area of residence, season of gestation, weight at birth, age of mother and of father, birth order, and, by deduction, occupation of father, residence of parents, and socioeconomic status.

A number of health departments have attempted to secure significant elements of the prenatal history, including labor, and an indication of the presence or absence of congenital malformation and birth injury by the use of a medical supplement to the birth certificate. Experience with this procedure appears to be fairly uniform. In areas in which hospital births approximate 95 percent of the birth experience, gross understatement of complications of pregnancy and labor has been noted when the findings are compared with data as found in the hospital history.

In my experience, I have found no insurmountable difficulties to securing accurate and complete data on specified segments of the prenatal and labor history of the mother and on the physical state of the newly born infant. The medical supplement to the birth record is a useful instrument for obtaining the birth

weight and information on operative procedures and complications of labor, but recourse to additional sources is necessary for a more complete measurement of several of the variables to be considered. For example, malformations often are not discovered until after the birth record is filed. When these conditions result in death, they will be noted on the death record, which can be matched with the appropriate birth record. Also, the public health nurse's visit to the home of the infant a few weeks after birth can be made the occasion of an examination for malformation and a report thereof. Another source is the program for crippled children.

The recorded birth universe is also an excellent source for the selection of a control population. In a study of the relationship of prenatal and paranatal factors and the development of epilepsy, for example, Lilienfeld and Pasamanik secured their case population from the available clinic registers and known institutionalized patients. For each case, they selected as a control the next infant in the birth register born in the same institution and matched for race and maternal age. They abstracted the hospital records for both series for certain variables of interest and compared the two groups.

These two methods—the use of the medical supplement to the birth record and the matched control hospital record survey—for obtaining data on factors associated with congenital disorders both involve to some extent a retroactive type of investigation. Essentially, at birth or following birth, an attempt is made to record the prenatal history of the infant or child. There are two serious limitations to this approach. If one is concerned with a known case of malformation, there is some tendency to search in the prenatal record or to query the mother about prenatal events with more care than in a case where no malformation is present, thus producing a bias that makes it impossible to construct any useful inferences. The second difficulty arises out of the fact that the records may not uniformly contain the detail required when we set about to answer questions based on past experience.

A Course of Action

Assuming that research in congenitally determined disorders suggests itself as worthy of statistical research by a health department, what is a practical course of action?

First, the birth record, including the fetal death record, should be used to describe the population at risk, the distribution characteristics of prematurity, and, to the extent that local conditions permit, the incidence of complications of pregnancy and labor. To obtain uniform coverage of prenatal history, summary sheets for inclusion in the hospital record can be provided.

Second, the birth record plus the fetal death record, the death record, and data on malformations from public health nurses, well baby clinics, and crippled children services should be used as a basis for estimating the incidence of congenital malformations and some of their distribution characteristics.

There are, no doubt, areas where the procedures given above will require years of nurture before data of value can be produced. It may be that, as a universal system is being developed, it would be desirable to construct a study area within a given jurisdiction consisting of the prenatal clinics administered by the local health departments, the teaching hospitals, and such other large obstetrical services willing and capable of participating in longitudinal studies. Each birth within the study area would be reported by the usual live birth certificate or fetal death record supplemented by a record of the prenatal life, the labor history, and a statement based upon an examination of the newborn for evidence of malformation. The public health statistical unit should be prepared to provide consultation on the study design and assistance in collation and interpretation of data.

At present, the most practical method for probing into the prenatal determinants of cerebral palsy, epilepsy, and mental deficiency remains the retroactive study, for these conditions are rarely apparent at birth. But this type of study would nevertheless benefit from the proposed universal collection scheme. The population as a whole would be described and known. The cases under study could be matched back to the appropriate birth record, and their characteristics thereby established.

Integrated Rehabilitation Of Cleft Palate Patients

brief Because of the variety of problems presented by the person with a cleft palate, no one specialty can attempt to deal with them all. A cleft palate is not just a "hole in the head" to be closed up in any fashion, or just a speech defect, or just a malocclusion. All of these conditions, along with the emotional and intellectual aspects, are related and interdependent. Hence, the team approach is gaining wide acceptance as the most productive way of rehabilitating these patients.

The essential services in rehabilitating the cleft palate patient are pediatrics, surgery, dentistry, orthodontia, prosthodontia, speech therapy, otolaryngology, psychology, and social service. Other services are added as the need arises. Each member of the team has a particular responsibility, but all members must work together for maximum effectiveness.

Pediatrics, Surgery

The pediatrician is in a position to guide the parents as soon as the baby is born. The manner in which he handles their attitudes and reactions toward the condition is all-important in the later adjustment of the parents to the child and, consequently, in the adjustment of the child himself to the handicap.

By Jeanette Laguaite, Ph.D., assistant professor of speech pathology, Tulane University School of Medicine.

The pediatrician can steer the parents' thinking toward the positive aspects of what can be done, rather than letting them dwell on the negative questions of what has not been done. He can reassure them that the baby can be provided with a cosmetically normal facial structure and with adequate oral structures for speech and nutrition.

It is the responsibility of the pediatrician, therefore, to acquaint the parents with a cleft palate team or with whatever agencies or resources are available in the community for cleft palate rehabilitation.

There is not much controversy concerning the surgical closure of the cleft lip. This procedure is usually carried out as soon as the baby is judged strong enough, usually about the third or fourth month.

Surgery on the palate, however, is another question, one that can best be answered through the team approach. The traditional treatment of cleft palate was by surgery. However, because surgery has so often been unsuccessful, many workers have felt that a reevaluation of surgical procedures, and especially of the timing of surgery, should be undertaken.

With the help of the orthodontist, prosthodontist, and speech therapist, the surgeon can better decide how and when to operate. The following criteria are now being used to judge whether or not a palate should be closed surgically and, if so, at what age:

1. Adequacy and vitality of tissue.
2. Spatial configuration of anatomic segments of the cleft, that is, width and shape of the cleft.
3. The relationship of the palate to contiguous anatomic structure in the pharynx.

Dentistry

Good general dental care is even more important for the cleft palate patient than for the average person. The successful use of a prosthetic device often depends upon the amount of retention which can be provided. Teeth should be cared for so that they do not become carious nor the gums diseased.

The influence of the deciduous teeth on the eruption of the permanent teeth and the consequent development of facial structures cannot be overemphasized. There is a direct relationship between the size and shape of the dental arch and the health of the baby teeth. Good habits of oral hygiene are a necessity for the cleft palate patient and must be instilled early and followed faithfully.

Through orthodontia, it is possible to restore teeth to their proper positions and to maintain them in their correct relationships. The orthodontist must have a thorough knowledge of growth factors and must know when to use appliances and what types to use to achieve the maximal results in alignment of structures. He aids the surgeon or prosthodontist by retaining the parts in the desired position or by repositioning structures so that they can work more effectively.

Prosthesis and speech appliances were formerly viewed as a last resort, after surgical failure. Subsequently, some workers developed the philosophy that prosthesis was the method of choice and that surgery should never be used.

It is now generally accepted that surgery and prosthesis offer complementary procedures for the rehabilitation of the cleft palate patient. When tissue is inadequate and a poor surgical result is almost a certainty, an appliance may be indicated from the beginning. Sometimes the surgeon can repair the hard palate but is unable to construct a functional soft palate. Then a speech appliance can be used to improve articulation. Young children may be fitted with a training appliance until they have reached the optimal age for surgery.

Speech Therapy, Otolaryngology

Among the several duties of the speech therapist, the most obvious one is the evaluation of the speech. In some patients, defective speech is due to causes other than the cleft, and the therapist must be able to differentiate these cases.

The therapist then must evaluate the structures in the light of the speech. Is the velo-pharyngeal closure adequate? Are there barriers to good tongue movement, such as orthodontic appliances? All these points must be assessed so that the advisability of further surgery, further orthodontia, or other procedures may be decided upon.

With a child who has not yet begun to talk, the speech therapist assumes the role of counselor to the parents. Ways in which to foster normal speech development and behavior to be avoided are discussed. As the child begins to talk, the parents are given specific suggestions for working with him at home until formal speech therapy is indicated.

Children with cleft palates are more susceptible to respiratory infections and more often have ear infections and accompanying hearing loss than normal children. They need careful periodic checkups to reduce the incidence of middle ear pathology.

Since much middle ear involvement is caused by blockage of the eustachian tube with hypertrophied lymphoid tissue, the otolaryngologist is faced with a problem in advising tonsillectomy and adenoidectomy. Often, the velo-pharyngeal closure which provides adequate speech is achieved because the palate rests against a large pad of adenoid tissue on the back wall of the pharynx. Removal of this adenoid pad may cause serious consequences speechwise. The otolaryngologist must decide whether an operation is indicated, how much tissue to remove, and the possible consequences to speech.

Social Service, Psychology

The social worker serves as a liaison between the team and the patient or his family. He interprets to the patient the decisions as to type of treatment, steps in the program, and the like. Also, he can help the team to plan by informing them of the attitudes and feelings of the family and the ability of the patient to cooperate and carry out recommended procedures.

In a total rehabilitation program, the mental and emotional factors are of vital importance. It is necessary to know the capacities of the patient so that a realistic policy can be pursued. Sometimes a patient, because

of intellectual capacity or economic, social, or emotional influences, is incapable of sufficient cooperation to make a prosthetic device practical. Therefore, surgery may be a better choice for him, although it is not the better one structurally.

The psychologist can be of value not only in testing, but in counseling and guiding both the patient and his family. A realistic, objective attitude to the handicap, an acceptance of the limitations of therapy, and a healthy emotional atmosphere can be as helpful as good surgery or a perfect appliance.

Excess Water in Milk—Georgia's Experience

brief A program for the detection and control of excess water in milk through the systematic use of the refractometer and cryoscope in Georgia has resulted in a marked decrease in the number of samples containing excess water. During the first year of the program, 1950, over 32 percent of the 2,623 milk samples examined showed excess water as compared to only 3.3 percent of the 16,176 samples examined during 1954. The results suggest that other States might find more water in their milk supplies if greater emphasis were given to this important examination.

Important in the success of the program was the excellent cooperation between State and local health department personnel in their work with milk plant operators and dairy farmers. Authority for milk control is not vested in the Georgia Department of Public Health. This department acts only in an advisory capacity to local health departments. The local departments have adequate authority to enforce regulations adopted by their boards of health. However, it is to the Georgia Department of Public Health that local health departments turn for assistance, advice, and guidance on milk sanitation, and for laboratory services.

By G. T. Knowles, Jr., M.A., J. R. Culp, B.S., and E. J. Sunkes, Dr.P.H., chief of the milk laboratory, chief milk sanitarian, and director of laboratory services, respectively, Georgia Department of Public Health.

The State laboratories first offered laboratory services for the examination of milk and dairy products during the latter part of 1948. From the beginning, a sufficient number of low lactometer readings were obtained to indicate the need for a thorough investigation of excess water in milk. Consequently, when the central laboratory milk unit began operating in April 1950, the detection of excess water was emphasized. The findings indicated that either adulteration or gross carelessness, or both, was a common practice.

In July 1950, the central laboratory instituted the cryoscopic method of determining excess water in milk as a routine laboratory procedure. The results obtained aroused widespread interest throughout the State and accelerated the demand for this service.

Methods

At the beginning of the program, the equipment and procedure outlined in Standard Methods for the Examination of Dairy Products was closely followed. This involved the use of the Hortvet cryoscope or its equivalent. It soon became apparent that the freezing of all samples with the cryoscope would be too time consuming for routine application. The other official procedures outlined were then investigated. From these, a modified sour serum method was developed for screening all samples for possible adulteration with water. A Bausch and Lomb juice refractometer was selected as the instrument for this screening job. With it, the percentage of dissolved serum solids could be read after filtering a small amount of milk which had been rapidly soured by adding 25 percent acetic acid and subsequently heating in a 70° C. water bath to speed the separation of milk curd and serum.

In 1952, Vandiviere, Brooks, and Sunkes reported a comparison of results obtained in a parallel study of 2,898 milk samples examined with both cryoscope and refractometer. This data indicated that a screening point of 7.55 percent dissolved serum solids, or greater, by the Bausch and Lomb refractometer reading, could be used to eliminate a large number of samples from cryoscopic examination.

It was then policy to report excess water in all samples in which the cryoscope indicated 3 percent or more excess water. This tolerance of 3 percent is allowed in the official procedures. Later, the policy was altered to allow for an operational error in addition to the 3 percent allowed for variation in the freezing point of normal milk.

Data on 7,115 milk samples examined during November 1951 through December 1952 revealed a definite break in the percentage of positive samples observed to lie between the refractometer readings of 7.40 and 7.35. Of the 1,628 samples with refractometer readings of 7.40 or higher, only 71, 0.9 percent of all samples, showed reportable excess water of 5 percent or greater when examined on the cryoscope, and only 23 had greater than 6 percent. Hence, most of these 71 samples were borderline cases considered to be of little significance.

The screening point for milk to be reported as "free of excess water" was set at 7.40. All samples showing a lower percentage of dissolved serum solids were then subjected to cryoscopic examination. Excess water is reported only when the cryoscope examination shows 5 percent or more present and is reported to the nearest 0.5 percent.

Evaluation Control

From the beginning, a monthly evaluation of the procedure has been maintained. The evaluation samples involve the use of a herd sample milked under the surveillance of a health department official. Milking machines and other containers are inspected to see that no excess

water gains entrance to the milk. Known amounts of water are then added to portions of this milk and samples in iced cases are shipped to reach the regional laboratory on the following day.

The evaluation samples are examined by all cryoscope operators routinely making examinations. The central laboratory, which acts as a control, performs its tests on the same day as the regional laboratories. By means of this evaluation program, the work done in the central laboratory and three regional laboratories is closely coordinated, and any need for restandardization of freezing-point thermometers is promptly indicated.

Education

Much of the success of this program can be attributed to the educational approach of the sanitarians in dealing with those in whose milk excess water has been found. Only in a few instances, where there was no response or indication of cooperation in keeping excess water out of the milk, have local health departments had to revoke the permits of offending dairymen.

Whenever excess water is found in milk, the laboratory report is accompanied with a slip of paper on which it is pointed out that "it is believed that in the majority of cases an excess of water is due to the lack of knowledge of the condition rather than willful adulteration on the part of the dairymen." Then, the following list gives possible causes of excess water in milk:

1. Utensils not thoroughly drained before use.
2. Leaking cooling boards which allow the cooling water to enter the milk when it is flowing over the board.
3. The use of leaking milk cans which, submerged in water, allow the water to enter the milk.
4. Haste to cool milk by placing ice directly in the milk.
5. The addition of water to milk by employees in an effort to impress the owner of the dairy with their ability to maintain or increase the volume of milk production.

Results

During the 5 years of the program, the incidence of watered milk has sharply dropped. During 1950, the first year of the program, 2,623 milk samples were examined with the cryoscope. Of these, 846, or 32.3 percent, contained excess water. However, since many of these examinations were made on repeat samples in which excess water was suspected, this did not mean that 32 percent of the milk being sold on the Georgia market was watered.

During 1951, 9,074 samples were screened with the Bausch and Lomb juice refractometer; 3,823 of these, plus 831 others, were examined with the cryoscope. Of the 9,905 samples submitted to screening or direct cryoscopic examination, 1,264, 12.8 percent, were found to contain 3 percent or greater excess water. Thus, in the second year of the program, the positive findings were reduced by almost two-thirds.

In 1952, only 9.0 percent of the samples examined contained excess water. Part of this decrease was due to the change in policy from reporting 3 and 4 percent findings. However, in 1953 the positive findings were further reduced to 4.7 percent. The extent of watering appears to have leveled off now, for examinations on 16,370 samples in 1954 yielded only 3.3 percent positive for excess water.

The Anthrax Epizootic In Louisiana in 1954

brief In 1954, Louisiana experienced its first significant anthrax epizootic since 1949. Outbreaks of the disease have been recognized in limited areas of the State each year since about 1880, but epizootics have occurred at infrequent intervals. Until the 1954 epizootic, anthrax appeared to occur in 30-year cycles. The first was recognized about 1890, the second in 1927, in the delta section; and the third in 1949, in the northwestern corner of the State.

Anthrax vaccine was used in each of the epizootics. Still in the experimental stage in 1890, the vaccine was adjudged to have had some bearing on the epizootiology of the disease, but when the supply was exhausted, the infection continued for only a short time. It appeared to burn itself out in northern Louisiana, several miles north of the last vaccinated areas. After the 1927 epizootic, when considerable research on the vaccine was conducted, several types became established on the market. Two types, the subcutaneous spore and the intradermal spore, have become traditional tools in increasing herd immunity to anthrax.

The 1954 epizootic in Louisiana apparently started in the relatively inaccessible delta region during June. The outbreak was recognized as a potential epizootic by July 18 and was confirmed as such by September 7. The last case was proved in the laboratory on October 20. Subcutis spore vaccine (No. 4) had been used extensively, but apparently it was not effective as administered.

Investigation of the epizootic was hampered by the type of terrain in the delta region and to some extent by the nature and customs of its people. The season, the temperature-humidity ratio, the sucking insect population, and the spread of the disease in a northerly direction appeared to be similar in all the epidemics that have occurred in the State so far.

The anthrax bacillus was isolated from a horsefly removed from a dying horse in the Venice area and from a fly taken from a febrile cow in the New Orleans area. Horsefly cultures were especially pathogenic for mice and displayed heavy capsular formation either directly from mice or when inoculated from first and second subcultures. However, no unusual cultural characteristics were observed.

By H. B. Elliott, D.V.M., director of laboratories, Louisiana Livestock Sanitary Board, Baton Rouge.

Orientation of Dentists In Administration

brief In mid-20th century, the dentist is a highly skilled technician in an intensively specialized health practice. Throughout his 4 years of study, the pressure is on to develop, simultaneously, scientific background and judgment and the manual skills of dentistry. In recent years patient education, regimens of treatment, and certain techniques of prevention have occupied an increasing but inadequate segment of the dental school curriculum. Yet in practice the dentist must meet community responsibilities as well as responsibilities for individuals. As a professional health practitioner, he must accept this role cast for him by the public.

To successfully accomplish these things within 4 years is a credit not only to the students but also to the pedagogical abilities of the school faculties. To be able to enter the competent practice of a profession upon graduation from school and licensure is evidence of the intensiveness and effectiveness of the course.

More important, however, to this discussion is the fact that such an intensive experience in health science, in methodology, and in technique makes for a high degree of specialization focused on the individual and his pathology.

Orientation

Like the physician, particularly one trained in a medical specialty, the dentist in public health has the double problem of unlearning the attitudes of individual care and developing the philosophy of the community as the patient. Yet, both the physician and the dentist undertook their course of study because of a real interest in the practice of the chosen profession.

The role of the dentist in public health administration must, therefore, be predicated on adequate public health orientation or training through which he has had opportunity to redirect his interests and philosophy to a different type of patient—the community. No longer should the correction of defects or disappearance of pathology in an individual be the objective, but rather the dental health of a group of people for all of their lives becomes his aim.

The second prerequisite for the dentist in public health administration, growing out of this change, must be the concept of family and communitywide service. Not only the potentiality of resources in a community to solve its own problems but the requirement of professional teamwork to exploit this strength must become a way of life for each public health worker. How the specialized professional skills of doctors, nurses, engineers, dentists, sanitarians, clerks, and so forth are integrated and coordinated determines to a great extent the effectiveness of the public health team. And effectiveness cannot be achieved without full realization of these facts by each member of the team.

The physician is ordinarily the leader of the public health team, and, in fact, by law in most States, the responsibility for local and State health departments must lie upon a physician. To meet this responsibility and to serve adequately as leader of the organization, he must become a generalist in many other public health sciences. His basic profession becomes only a part of the spectrum of skills which he and the community must use to create a state approaching complete well-being. The less provincial he remains with respect to medicine, the more effective he is as a public health administrator. And this holds true for one who is to assist in administration.

For any professional person in public health, therefore, a basic decision must always be made, usually early in his experience—do I wish to be a public health or a program administrator? For the former the entire field becomes the generalist's bailiwick. For the latter, the program becomes the specialist's area in which his profession may remain his primary interest, though it must still be seen in proper relation to the other fields of public health.

Public Health Duties

The dentist may effectively be an administrator of the dental public health program. In this responsibility he must solve such problems as competence of professional individual care in the community; availability of care to all members of the community; development of the attitudes and philosophy of health maintenance and promotion, as well as correction; and the application of preventive measures, such as nutrition, topical fluoride, and fluoridation of public water supplies. He should be delegated the authority to represent the health department in dental matters; to expedite dental health education activities, and to serve as liaison with dentists and their organizations. He must be able to evaluate dental programs, promote professional growth in the dentists, and insure the application of community resources to all of the community needs. And in doing these things he must have a sympathetic appreciation of the entire public health program, supporting it even as he works within his own field.

A second possibility for the trained and experienced dentist is in general public health administration. The educational background in the health sciences, once the transition to public health philosophy has been attained, should make the dentist invaluable in public health administration provided he can be comfortable in this relation to the health officer. Medical people need training and experience in the matter of delegation and sharing responsibility but can make this transition. The dentist, like a physician, must become a generalist, leaving behind the concentrated interest in one profession for the overall team approach. Yet, like the physician with the minimum of clinical medicine as a taproot to his profession, so would the dental administrator wish to keep contact with his parent profession.

In either instance, the dental public health administrator, who has successfully made the transition

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from individual to community for a patient, and to health maintenance and promotion and prevention of disease as an objective rather than the correction or repair of disease, will derive deep satisfaction from his practice.

And satisfaction in the job he has done and the consciousness of important service rendered leave little for a professional to want.

Inter-American Health Program Since 1942

brief Competent observers agree that there has been startling and thrilling improvement in the health of people living south of the Rio Grande. That this is so, they also agree, is due to the aggressive activity of public health workers in the countries of Latin America, living and working in a land with a future.

Real help in the form of stimulation and technical assistance has come from foundations such as Rockefeller and Kellogg and more recently from international and national official agencies such as the Pan American Sanitary Bureau and the International Cooperation Administration—the new agency assuming the functions of the Foreign Operations Administration.

Since 1942 the United States Government, through the Institute of Inter-American Affairs, has been offering technical assistance to the ministries of health of Latin America. The IIAA, as it has become well known, now continues its work as part of the International Cooperation Administration.

As of today there are cooperative bilateral health programs with 18 sovereign republics in Latin America and with the 3 semi-independent governments of Surinam, British Guiana, and Jamaica. This work is carried on by 135 United States professional health workers and more than 2,000 professional workers from the Latin American countries. An additional 5,000 subprofessional and clerical workers are employed in the operational phases of the programs.

The work is financed by an annual appropriation on the part of the United States of approximately $5 million. The United States contribution is more than matched by the Latin American governments. Last year they appropriated more than $12 million in local currencies.

It is unnecessary to describe in detail all the activities that have taken place since 1942. Programs of basic sanitation, community health promotion, and professional education have received priority by common consent.

Within the past 18 months some important changes have been made in the orientation of some of the cooperative programs with the separate countries. Characterized in the early years by operational projects, often turned over completely to United States technicians for professional management, more and more the operational phases are properly being assumed by the Latin American ministries of health. Technical advice and consultation continue to be offered by our technicians working directly with the ministries. This encouraging trend is receiving the active support of the International Cooperation Administration.

During this same period, in addition to continuing work in all of the original fields of health activity, an effort has been made to expand into new fields in order to keep up with the needs of a rapidly developing region. Work has been started in health education, nutrition, industrial hygiene, and medical education. Assistance has been given in organizing a model State health department in Brazil, the largest and one of the more decentralized countries of Latin America.

A pleasant aspect of the inter-American health picture is the maturing relationship among the several agencies, public and private, working in this field of international health. The International Cooperation Administration is participating actively in efforts to improve this coordination. Joint planning with the Pan American Sanitary Bureau in medical education and mass disease control is part of this effort. The Pan American Sanitary Bureau has established, in Washington, D. C., a center for the exchange of information on medical education to which all interested agencies make contributions. By such formal means, and by means of frequent friendly informal exchange of ideas and information, a fine working relationship has developed.

This bright picture I have painted is not intended to convey the impression that all, or even most, of the problems are solved. Latin America still faces towering problems in public health, in many areas with grossly inadequate resources. The region supports only 1 physician per 3,000 population and 1 nurse per 15,000. Training facilities for both physicians and nurses need improvement. There are still mass disease control problems in such fields as malaria, diarrheal disease, and tuberculosis. Much remains to be done. but movement is occurring, and in the right direction.

Although the ministries of health have good leadership at the top, there are deficiencies in depth. Many more trained workers in the public health professions are needed at the local level. Considerable work still needs to be done in extending public health services to this level.

In moving to meet its needs, Latin America has available some fine resources. They are mostly governmental, however, since the voluntary health organization, as we know it in the United States, is not well represented in Latin America. For this reason a major effort of the cooperative health program is encouragement of voluntary health agencies to complement the work of official agencies.

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